**IN THE UNITED STATES DISTRICT COURT**
**FOR THE DISTRICT OF DELAWARE**

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| REIN TECH, INC.,<br><br>Plaintiff,<br><br>v.<br><br>MUELLER SYSTEMS, LLC<br><br>Defendant. | C.A. No. 1:18-cv-01683-MN<br><br>**PUBLIC VERSION** |

**DEFENDANT'S LETTER TO THE COURT IN SUPPORT OF DEFENDANT'S MOTION FOR SANCTIONS DUE TO PLAINTIFF'S VIOLATIONS OF THE PROTECTIVE ORDER**

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Dated: May 12, 2025

Dear Judge Noreika,

Defendant Mueller Systems, LLC ("Mueller") respectfully moves, pursuant to Fed. R. Civ. P. 37(b) and D. Del. LR 1.3, for sanctions due to Plaintiff Rein Tech, Inc.'s multiple and continued violations of the Protective Order.

**A. The Protective Order's AEO Restrictions and Patent Prosecution Bar.**

Under the Protective Order (D.I. 32, attached as Exhibit A), access to and disclosure of material designated "RESTRICTED – ATTORNEYS' EYES ONLY" ("AEO material") is restricted to certain, specific individuals. As relevant here, AEO material may *not* be disclosed to representatives of a party and may only be disclosed to "in-house counsel" "who exercise no competitive decision-making authority on behalf of the client." (Ex. A ¶¶ 9, 5(c).) Further, the Protective Order provides that any person "who obtains, receives, has access to, or otherwise learns, in whole or in part," the other party's AEO material "shall not prepare, prosecute, supervise, or assist in the preparation or Prosecution of any patent application pertaining to the Field of Invention of the Patents-in-Suit," where "'Prosecution' includes without limitation original prosecution, reissue, reexamination, *certificate of correction*, inter partes review, covered business method review, or other procedure that may affect the scope of patent claims." (*Id.* ¶ 11 (emphasis added).) "To ensure compliance," each party "shall create an 'Ethical Wall' between those persons with access to" AEO material and any individuals who prepare or prosecute any patent application pertaining to the field of invention. (*Id.*)

**B. Michael Klicpera, Esq. – Rein Tech's Principal, Named Inventor, Prosecuting Attorney, and Proffered Testifying Expert.**

Klicpera is the President of Rein Tech (Exhibit B) and the named inventor on the remaining asserted patent, U.S. Patent No. 11,549,837 ("the '837 patent") (Exhibit C). Klicpera is a registered patent attorney; he filed and prosecuted the '837 patent (Ex. C), the patents previously asserted in this litigation (D.I. 1-1), and many other patents relating to water meter devices (Exhibit D, Rein Tech's Opening Expert Report at 3).

In connection with the '837 patent, between March and September, 2024, Klicpera filed four separate Requests for Certificate of Correction ("Requests"), three of which were denied. On July 22, 2024, for example, Klicpera filed a Request seeking to make numerous amendments to each of claims 42–51 of the '837 patent. (Exhibit E at 4–9.) On August 27, 2024, the USPTO denied the Request and asked for certain clarifications. (Exhibit F at 3.) Klicpera submitted a further Request on September 16, 2024, which was approved on November 25, 2024. (Exhibits G–H.) The Certificate of Correction issued on October 15, 2024. (Exhibit I.)

During expert discovery, Klicpera submitted (1) a "Layman's Affidavit" (Exhibit J) on February 18, 2025, which was later withdrawn; (2) an Opening Expert Report (Ex. D) on February 26, 2024, to replace the Layman's Affidavit; (3) a Rebuttal Expert Report (Exhibit K) on March 18, 2024; and (4) a Reply Expert Report (Exhibit L). Accordingly, Rein Tech purports to proffer Klicpera as its testifying expert on infringement, validity, and damages.

On April 2, 2025, Rein Tech purported to serve Supplemental Infringement Contentions to assert claims of the '837 patent as amended by the October 15, 2024, Certificate of Correction. (Exhibit M.) Rein Tech's motion for leave to supplement its contentions well after the close of fact discovery and deadline for final infringement contentions is the subject of the parties' separate discovery dispute. (*See* D.I. 165.)

**C. Rein Tech's Violations of the Protective Order's Access and Disclosure Restrictions for AEO Material.**

Based on at least the exhibits to Klicpera's Layman's Affidavit, Klicpera's Opening Expert Report, and Rein Tech's Supplemental Infringement Contentions, it is clear that Klicpera has accessed, reviewed, and used Mueller's AEO material for purposes of this litigation and Rein Tech's patent portfolio. For example, both the Layman's Affidavit and the Opening Report cite to, discuss, and attach as an exhibit Mueller's Responses to Interrogatory Nos. 1-25, which are designated as AEO material and include confidential and technical details about Mueller's products and network architecture. (Exhibit N, Ex. 2 to the Layman's Affidavit; Exhibit O, Ex. 2 to the Opening Expert Report.) In fact, Rein Tech improperly filed its Laymen's Affidavit with the Court as D.I. 154, rendering Mueller's confidential interrogatory responses publicly available on the docket as D.I. 154-2 (see Ex. N) until the Court deleted it as an improper filing. (*See* 2/19/2025 Docket Entry.) In addition, Exhibits 13–20 and 22 to Rein Tech's Supplemental Infringement Contentions include Mueller's confidential, technical specifications and engineering drawings concerning the accused products, all of which are marked as AEO material. (Exhibit P, collectively, Exs. 13–20 and 22 to the Supplemental Infringement Contentions.)

During the parties' April 28, 2025, meet and confer, Rein Tech's outside counsel, who substituted in for prior counsel on November 22, 2014 (D.I. 149), stated that he had not been given access to any of Mueller's AEO material produced during discovery, including but not limited to the exhibits referenced above. Thus, Klicpera must have had possession of those confidential exhibits when Rein Tech served its expert reports and supplemental contentions. Mueller believes that Klicpera was given access to all of Mueller's document productions and discovery responses, including its AEO material, in connection with Rein Tech's prior substitutions of counsel, starting at least as early as February 2024. *See* D.I. 128 (Notice of Substitution of Counsel). Mueller further believes that Klicpera has had access to and reviewed large quantities of Mueller's discovery and AEO material given that he purports to serve as Rein Tech's testifying expert on infringement and damages.

Rein Tech asserts that it "is a practicing entity" (D.I. 91, Second Am. Compl. ¶ 2) and Klicpera, its President, founder, and for all intents and purposes alter ego, avers that "Rein Tech is continuing in its water meter development to reduce its footprint, develop its own ultrasonic flow sensor, and improving its software and cell phone APP" (Ex. K at 64). Accordingly, Klicpera exercises competitive decision-making authority on behalf of Rein Tech and his access to and review of Mueller's AEO material constitutes a violation of at least Paragraph 9 of the Protective Order. (Ex. A ¶ 9.) *See U.S. Steel Corp. v. United States*, 730 F.2d 1465, 1468 n.3 (Fed. Cir. 1984) ("Competitive decision-making" is a "shorthand for a counsel's activities, association, and relationship with a client that are such as to involve counsel's advice and participation in any or

all of the client's decisions (pricing, product design, etc.) made in light of similar or corresponding information about a competitor").[1]

**D. Rein Tech's Violations of the Patent Prosecution Bar.**

In addition—or in the alternative—Rein Tech has violated the Protective Order by allowing Klicpera to continue to prosecute patent applications in the field of the invention after accessing Mueller's AEO material. This includes, without limitation, Klicpera's prosecution of U.S. Appl. No. 17/981,454 titled "Water Meter and Leak Detection System." On February 28, 2025, for example, Klicpera filed an Office Action Response with numerous, substantive amendments affecting the scope of patent claims. (Exhibit Q.) It also includes, without limitation, Klicpera's prosecution of the Certificate of Correction for the '837 patent between September and October 2024. (Exs. E–I.) Such acts constitute a violation of at least Paragraph 11 of the Protective Order. (Ex. A ¶ 11.)

**E. Mueller's Requested Relief.**

Mueller respectfully seeks sanctions against Rein Tech for its multiple violations of the Protective Order. The scope of these violations has yet to be fully determined, but they appear to have occurred over many months if not longer. Rein Tech's violations are not minor, inadvertent disclosures; they were undertaken with a specific intent to misuse Mueller's competitively sensitive information for gain in this litigation.

Mueller asks the Court to enjoin further violations (including precluding Klicpera from continued access to Mueller's AEO material); order that Klicpera be disqualified from serving as a testifying witness at trial; order that the Certificate of Correction and any other evidence obtained in violation of the Protective Order be excluded from trial; award monetary sanctions including Mueller's fees and costs in addressing Rein Tech's violations and bringing this motion; and issue other appropriate sanctions to rectify Rein Tech's and Klicpera's improper conduct. *See, e.g.*, *TRUSTID, Inc. v. Next Caller Inc.*, No. 18-cv-172-MN, 2021 WL 11960341, at *3 (D. Del. July 12, 2021) (awarding monetary and evidentiary sanctions where plaintiff's "careless, reckless, and willful violations of the Protective Order" harmed defendant and threatened "the credibility of this Court in assuring that sensitive information required to be produced during discovery will be protected from unwarranted disclosure").

Respectfully,

*/s/ Kenneth L. Dorsney*
Kenneth L. Dorsney (#3726)

cc: All Counsel of Record (via ECF)

[1] This presumes that Klicpera is acting as Rein Tech's in-house counsel. If he is acting as a representative of Rein Tech, he would also be barred from accessing Mueller's AEO material. (Ex. A ¶ 9.)

# EXHIBIT A

**IN THE UNITED STATES DISTRICT COURT**
**FOR THE DISTRICT OF DELAWARE**

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|---|---|---|
| REIN TECH, INC., | ) | |
| | ) | |
| Plaintiff, | ) | |
| | ) | |
| v. | ) | Civil Action No. 18-cv-1683-MN |
| | ) | |
| MUELLER SYSTEMS LLC, | ) | |
| | ) | |
| Defendant. | ) | |

**AGREED PROTECTIVE ORDER**

WHEREAS Plaintiff Rein Tech, Inc., and Defendant Mueller Systems, LLC, hereafter referred to as "the Parties," believe that certain information that is or will be encompassed by discovery demands by the Parties involves the production or disclosure of trade secrets, confidential business information, or other proprietary information;

WHEREAS the Parties seek a protective order limiting disclosure thereof in accordance with Federal Rule of Civil Procedure 26(c):

THEREFORE, it is hereby stipulated among the Parties and ORDERED that:

1. Each Party may designate as confidential for protection under this Order, in whole or in part, any document, information or material that constitutes or includes, in whole or in part, confidential or proprietary information or trade secrets of the Party or a Third Party to whom the Party reasonably believes it owes an obligation of confidentiality with respect to such document, information or material ("Protected Material"). Protected Material shall be designated by the Party producing it by affixing a legend or stamp on such document, information or material as follows: "CONFIDENTIAL." The word "CONFIDENTIAL" shall be placed clearly on each page of the Protected Material (except deposition and hearing transcripts) for which such protection is sought. For deposition and hearing transcripts, the

word "CONFIDENTIAL" shall be placed on the cover page of the transcript (if not already present on the cover page of the transcript when received from the court reporter) by each attorney receiving a copy of the transcript after that attorney receives notice of the designation of some or all of that transcript as "CONFIDENTIAL."

2. Any document produced before issuance of this Order with the designation "Confidential" or "Confidential - Outside Attorneys' Eyes Only" shall receive the same treatment as if designated "RESTRICTED - ATTORNEYS' EYES ONLY" under this Order, unless and until such document is redesignated to have a different classification under this Order.

3. With respect to documents, information or material designated "CONFIDENTIAL," "RESTRICTED - ATTORNEYS' EYES ONLY," or "RESTRICTED CONFIDENTIAL SOURCE CODE" (collectively, "DESIGNATED MATERIAL"),[1] subject to the provisions herein and unless otherwise stated, this Order governs, without limitation: (a) all documents, electronically stored information, and/or things as defined by the Federal Rules of Civil Procedure; (b) all pretrial, hearing or deposition testimony, or documents marked as exhibits or for identification in depositions and hearings; (c) pretrial pleadings, exhibits to pleadings and other court filings; (d) affidavits; and (e) stipulations. All copies, reproductions, extracts, digests and complete or partial summaries prepared from any DESIGNATED MATERIALS shall also be considered DESIGNATED MATERIAL and treated as such under this Order.

[1] The term DESIGNATED MATERIAL is used throughout this Protective Order to refer to the class of materials designated as "CONFIDENTIAL," "RESTRICTED - ATTORNEYS' EYES ONLY," or "RESTRICTED CONFIDENTIAL SOURCE CODE," both individually and collectively.

4. A designation of Protected Material (i.e., "CONFIDENTIAL," "RESTRICTED - ATTORNEYS' EYES ONLY," or "RESTRICTED CONFIDENTIAL SOURCE CODE") may be made at any time. Inadvertent or unintentional production of documents, information or material that has not been designated as DESIGNATED MATERIAL shall not be deemed a waiver in whole or in part of a claim for confidential treatment. Any Party that inadvertently or unintentionally produces Protected Material without designating it as DESIGNATED MATERIAL may request destruction of that Protected Material by notifying the recipient(s), as soon as reasonably possible after the producing Party becomes aware of the inadvertent or unintentional disclosure, and providing replacement Protected Material that is properly designated. The recipient(s) shall then destroy all copies of the inadvertently or unintentionally produced Protected Materials and any documents, information or material derived from or based thereon.

5. "CONFIDENTIAL" documents, information and material may be disclosed only to the following persons, except upon receipt of the prior written consent of the designating party, upon order of the Court, or as set forth in paragraph 12 herein:

(a) outside counsel of record in this Action for the Parties;

(b) employees of such counsel assigned to and reasonably necessary to assist such counsel in the litigation of this Action;

(c) in-house counsel for the Parties who either have responsibility for making decisions dealing directly with the litigation of this Action, or who are assisting outside counsel in the litigation of this Action;

(d) up to and including four (4) designated representatives of each of the Parties to the extent reasonably necessary for the litigation of this Action, except that either party may in good faith request the other party's consent to designate one or more additional representatives, the other party shall not unreasonably withhold such consent, and the requesting party may seek leave of Court to designate such additional representative(s) if the requesting party believes the other party has unreasonably withheld such consent;

(e) outside consultants or experts (*i.e.*, not existing employees or affiliates of a Party or an affiliate of a Party) retained for the purpose of this litigation, provided that: (1) such consultants or experts are not presently employed by the Parties hereto for purposes other than this Action; (2) before access is given, the consultant or expert has completed the Undertaking attached as Exhibit A hereto and the same is served upon the producing Party with a current curriculum vitae of the consultant or expert at least ten (10) days before access to the Protected Material is to be given to that consultant or Undertaking to object to and notify the receiving Party in writing that it objects to disclosure of Protected Material to the consultant or expert. The Parties agree to promptly confer and use good faith to resolve any such objection. If the Parties are unable to resolve any objection, the objecting Party may file a motion with the Court within fifteen (15) days of the notice, or within such other time as the Parties may agree, seeking a protective order with respect to the proposed disclosure. The objecting Party shall have the burden of proving the need for a protective order. No disclosure shall occur until all such objections are resolved by agreement or Court order;

(f) independent litigation support services, including persons working for or as court reporters, graphics or design services, jury or trial consulting services, discovery vendors, and photocopy, document imaging, and database services retained by counsel and reasonably necessary to assist counsel with the litigation of this Action; and

(g) the Court and its personnel.

6. A Party shall designate documents, information or material as "CONFIDENTIAL" only upon a good faith belief that the documents, information or material contains confidential or proprietary information or trade secrets of the Party or a Third Party to whom the Party reasonably believes it owes an obligation of confidentiality with respect to such documents, information or material.

7. Documents, information or material produced pursuant to any discovery request in this Action, including but not limited to Protected Material designated as DESIGNATED MATERIAL, shall be used by the Parties only in the litigation of this Action and shall not be used for any other purpose. Any person or entity who obtains access to DESIGNATED MATERIAL or the contents thereof pursuant to this Order shall not make any copies, duplicates, extracts, summaries or descriptions of such DESIGNATED MATERIAL or any

portion thereof except as may be reasonably necessary in the litigation of this Action. Any such copies, duplicates, extracts, summaries or descriptions shall be classified DESIGNATED MATERIALS and subject to all of the terms and conditions of this Order, including the "return or destroy" requirements described in paragraph 22.

8. To the extent a producing Party believes that certain Protected Material qualifying to be designated CONFIDENTIAL is so sensitive that its dissemination deserves even further limitation, the producing Party may designate such Protected Material "RESTRICTED -- ATTORNEYS' EYES ONLY," or to the extent such Protected Material includes computer source code and/or live data (that is, data as it exists residing in a database or databases) ("Source Code Material"), the producing Party may designate such Protected Material as "RESTRICTED CONFIDENTIAL SOURCE CODE."

9. For Protected Material designated RESTRICTED -- ATTORNEYS' EYES ONLY, access to, and disclosure of, such Protected Material shall be limited to individuals listed in paragraphs 5(a-c) and (e-g) ; provided, however, that access by in-house counsel pursuant to paragraph 5(c) be limited to in-house counsel who exercise no competitive decision-making authority on behalf of the client.

10. For Protected Material designated RESTRICTED CONFIDENTIAL SOURCE CODE, the following additional restrictions apply:

(a) Access to a Party's Source Code Material shall be provided only on "stand-alone" computer(s) (that is, the computer may not be linked to any network, including a local area network ("LAN"), an intranet or the Internet). The stand-alone computer(s) may be connected to (i) a printer, or (ii) a device capable of temporarily storing electronic copies solely for the limited purposes permitted pursuant to paragraphs 10 (h and k) below. Additionally, except as provided in paragraph 10(k) below, the stand-alone computer(s) may only be located at the offices of the producing Party's outside counsel;

(b) The receiving Party shall make reasonable efforts to restrict its requests for such access to the stand-alone computer(s) to normal business hours, which for purposes of this paragraph shall be 8:00 a.m. through 6:00 p.m. However, upon reasonable notice from the receiving party, the producing Party shall make reasonable efforts to accommodate the receiving Party's request for access to the stand-alone computer(s) outside of normal business hours. The Parties agree to cooperate in good faith such that maintaining the producing Party's Source Code Material at the offices of its outside counsel shall not unreasonably hinder the receiving Party's ability to efficiently and effectively conduct the prosecution or defense of this Action;

(c) The producing Party shall provide the receiving Party with information explaining how to start, log on to, and operate the stand-alone computer(s) in order to access the produced Source Code Material on the stand-alone computer(s);

(d) The producing Party will produce Source Code Material in computer searchable format on the stand-alone computer(s) as described above;

(e) Access to Protected Material designated RESTRICTED CONFIDENTIAL - SOURCE CODE shall be limited to outside counsel and up to three (3) outside consultants or experts[2] (*i.e.*, not existing employees or affiliates of a Party or an affiliate of a Party) retained for the purpose of this litigation and approved to access such Protected Materials pursuant to paragraph 5(e) above. A receiving Party may include excerpts of Source Code Material in a pleading, exhibit, expert report, discovery document, deposition transcript, other Court document, provided that the Source Code Documents are appropriately marked under this Order, restricted to those who are entitled to have access to them as specified herein, and, if filed with the Court, filed under seal in accordance with the Court's rules, procedures and orders;

(f) To the extent portions of Source Code Material are quoted in a Source Code Document, either (1) the entire Source Code Document will be stamped and treated as RESTRICTED CONFIDENTIAL SOURCE CODE or (2) those pages containing quoted Source Code Material will be separately stamped and treated as RESTRICTED CONFIDENTIAL SOURCE CODE;

(g) Except as set forth in paragraph 10(k) below, no electronic copies of Source Code Material shall be made without prior written consent of the producing Party, except as necessary to create documents which, pursuant to the Court's rules, procedures and order, must be filed or served electronically;

[2] For the purposes of this paragraph, an outside consultant or expert is defined to include the outside consultant's or expert's direct reports and other support personnel, such that the disclosure to a consultant or expert who employs others within his or her firm to help in his or her analysis shall count as a disclosure to a single consultant or expert.

(h) The receiving Party shall be permitted to make printouts and photocopies of Source Code Material that are reasonably necessary for the limited purpose of use for motions or at depositions, hearings, or trial, all of which shall be designated and clearly labeled "RESTRICTED CONFIDENTIAL SOURCE CODE," and the receiving Party shall maintain a log of all such files that are printed or photocopied;

(i) Should such printouts or photocopies be transferred back to electronic media, such media shall be labeled "RESTRICTED CONFIDENTIAL SOURCE CODE" and shall continue to be treated as such;

(j) If the receiving Party's outside counsel, consultants, or experts obtain printouts or photocopies of Source Code Material, the receiving Party shall ensure that such outside counsel, consultants, or experts keep the printouts or photocopies in a secured locked area in the offices of such outside counsel, consultants, or expert. The receiving Party may also temporarily keep the printouts or photocopies at: (i) the Court for any proceedings(s) relating to the Source Code Material, for the dates associated with the proceeding(s); (ii) the sites where any deposition(s) relating to the Source Code Material are taken, for the dates associated with the deposition(s); and (iii) any intermediate location reasonably necessary to transport the printouts or photocopies (*e.g.*, a hotel prior to a Court proceeding or deposition); and

(k) A producing Party's Source Code Material may only be transported by the receiving Party at the direction of a person authorized under paragraph 10(e) above to another person authorized under paragraph 10(e) above, on paper or removable electronic media (*e.g.*, a DVD, CD-ROM, or flash memory "stick") via hand carry, Federal Express or other similarly reliable courier provided that Source Code Material may only be transported electronically for the purpose of Court proceeding(s) or deposition(s) as set forth in paragraph 10(j) above and is at all times subject to the transport restrictions set forth herein. But, for those purposes only, the Source Code Materials may be loaded onto a stand-alone computer. Source Code Material may not be transported or transmitted electronically over a network of any kind, including a LAN, an intranet, or the Internet.

11. Any attorney representing a Party, whether in-house or outside counsel, and any person associated with a Party and permitted to receive the other Party's Protected Material that is designated RESTRICTED -- ATTORNEYS' EYES ONLY and/or RESTRICTED CONFIDENTIAL SOURCE CODE (collectively "HIGHLY SENSITIVE MATERIAL"), who obtains, receives, has access to, or otherwise learns, in whole or in part, the other Party's HIGHLY SENSITIVE MATERIAL under this Order shall not prepare, prosecute, supervise, or assist in the preparation or Prosecution of any patent application pertaining to

the Field of Invention of the Patents-in-Suit (*i.e.*, U.S. Patent Nos. 8,347,427; 9,297,150; and 9,749,792) during the pendency of this Action and for one year after its conclusion, including any appeals. For purposes of this paragraph, "Prosecution" includes without limitation original prosecution, reissue, reexamination, certificate of correction, *inter partes* review, covered business method review, or other procedure that may affect the scope of patent claims, but does not include an attorney or person that may assist in Prosecution but is not involved in the drafting of new claims or claim amendments . For purposes of this paragraph, "Field of the Invention of the Patents-in-Suit" includes the field described in the "FIELD OF THE INVENTION" section of the Patents-in-Suit. To ensure compliance with the purpose of this provision, each Party shall create an "Ethical Wall" between those persons with access to HIGHLY SENSITIVE MATERIAL and any individuals who, on behalf of the Party or its acquirer, successor, predecessor, or other affiliate, prepare, prosecute, supervise or assist in the preparation or prosecution of any patent application pertaining to the Field of Invention of the Patents-in-Suit.

12. Nothing in this Order shall require production of documents, information or other material that a Party contends is protected from disclosure by the attorney-client privilege, the work product doctrine, or other privilege, doctrine, or immunity. If documents, information or other material subject to a claim of attorney-client privilege, work product doctrine, or other privilege, doctrine, or immunity is inadvertently or unintentionally produced, such production shall in no way prejudice or otherwise constitute a waiver of, or estoppel as to, any such privilege, doctrine, or immunity. Any Party that inadvertently or unintentionally produces documents, information or other material it reasonably believes are protected under the attorney-client privilege, work product doctrine, or other privilege, doctrine, or immunity

may obtain the return of such documents, information or other material by promptly notifying the recipient(s) and providing a privilege log for the inadvertently or unintentionally produced documents, information or other material. The recipient(s) shall gather and return all copies of such documents, information or other material to the producing Party, except for any pages containing privileged or otherwise protected markings by the recipient(s), which pages shall instead be destroyed and certified as such to the producing Party.

13. There shall be no disclosure of any DESIGNATED MATERIAL by any person authorized to have access thereto to any person who is not authorized for such access under this Order. The Parties are hereby ORDERED to safeguard all such documents, information and material to protect against disclosure to any unauthorized persons or entities.

14. Nothing contained herein shall be construed to prejudice any Party's right to use any DESIGNATED MATERIAL in taking testimony at any deposition or hearing provided that the DESIGNATED MATERIAL is only disclosed to a person(s) who is: (i) eligible to have access to the DESIGNATED MATERIAL by virtue of his or her employment with the designating party, (ii) identified in the DESIGNATED MATERIAL as an author, addressee, or copy recipient of such information, (iii) although not identified as an author, addressee, or copy recipient of such DESIGNATED MATERIAL, has, in the ordinary course of business, seen such DESIGNATED MATERIAL, (iv) a current or former officer, director or employee of the producing Party or a current or former officer, director or employee of a company affiliated with the producing Party; (v) counsel for a Party, including outside counsel and in-house counsel (subject to paragraph 9 of this Order); (vi) an independent contractor, consultant, and/or expert retained for the purpose of this litigation; (vii) court

reporters and videographers; (viii) the Court; or (ix) other persons entitled hereunder to access to DESIGNATED MATERIAL. DESIGNATED MATERIAL shall not be disclosed to any other persons unless prior authorization is obtained from counsel representing the producing Party or from the Court.

15. Parties may, at the deposition or hearing or within thirty (30) days after receipt of a deposition or hearing transcript, designate the deposition or hearing transcript or any portion thereof as "CONFIDENTIAL," "RESTRICTED - ATTORNEYS' EYES ONLY," or "RESTRICTED CONFIDENTIAL SOURCE CODE" pursuant to this Order. Access to the deposition or hearing transcript so designated shall be limited in accordance with the terms of this Order. Until expiration of the 30-day period, the entire deposition or hearing transcript shall be treated as RESTRICTED - ATTORNEYS' EYES ONLY.

16. Any DESIGNATED MATERIAL that is filed with the Court shall be filed under seal and shall remain under seal until further order of the Court. The filing party shall be responsible for informing the Clerk of the Court that the filing should be sealed and for placing the legend "FILED UNDER SEAL PURSUANT TO PROTECTIVE ORDER" above the caption and conspicuously on each page of the filing. Exhibits to a filing shall conform to the labeling requirements set forth in this Order. If a pretrial pleading filed with the Court, or an exhibit thereto, discloses or relies on confidential documents, information or material, such confidential portions shall be redacted to the extent necessary and the pleading or exhibit filed publicly with the Court.

17. The Order applies to pretrial discovery. Nothing in this Order shall be deemed to prevent the Parties from introducing any DESIGNATED MATERIAL into evidence at the trial of this Action, or from using any information contained in DESIGNATED MATERIAL at

the trial of this Action, subject to any pretrial order issued by this Court.

18. A Party may request in writing to the other Party that the designation given to any DESIGNATED MATERIAL be modified or withdrawn. If the designating Party does not agree to redesignation within ten (10) days of receipt of the written request, the requesting Party may apply to the Court for relief. Upon any such application to the Court, the burden shall be on the designating Party to show why its classification is proper. Such application shall be treated procedurally as a motion to compel pursuant to Federal Rules of Civil Procedure 37, subject to the Rule's provisions relating to sanctions. In making such application, the requirements of the Federal Rules of Civil Procedure and the Local Rules of the Court shall be met. Pending the Court's determination of the application, the designation of the designating Party shall be maintained.

19. Each outside consultant or expert to whom DESIGNATED MATERIAL is disclosed in accordance with the terms of this Order shall be advised by counsel of the terms of this Order, shall be informed that he or she is subject to the terms and conditions of this Order, and shall sign an acknowledgment that he or she has received a copy of, has read, and has agreed to be bound by this Order. A copy of the acknowledgment form is attached as Appendix A.

20. To the extent that any discovery is taken of persons who are not Parties to this Action ("Third Parties") and in the event that such Third Parties contended the discovery sought involves trade secrets, confidential business information, or other proprietary information, then such Third Parties may agree to be bound by this Order.

21. To the extent that discovery or testimony is taken of Third Parties, the Third Parties may designate as "CONFIDENTIAL," "RESTRICTED -- ATTORNEYS' EYES ONLY," or

"RESTRICTED CONFIDENTIAL SOURCE CODE" any documents, information or other material, in whole or in part, produced or given by such Third Parties. The Third Parties shall have ten (10) days after production of such documents, information or other materials to make such a designation. Until that time period lapses or until such a designation has been made, whichever occurs sooner, all documents, information or other material so produced or given shall be treated as "CONFIDENTIAL" in accordance with this Order.

22. Within thirty (30) days of final termination of this Action, including any appeals, all DESIGNATED MATERIAL, including all copies, duplicates, abstracts, indexes, summaries, descriptions, and excerpts or extracts thereof (excluding excerpts or extracts incorporated into any privileged memoranda of the Parties and materials which have been admitted into evidence in this Action), shall at the producing Party's election either be returned to the producing Party or be destroyed. The receiving Party shall verify the return or destruction by affidavit furnished to the producing Party, upon the producing Party's request.

23. The failure to designate documents, information or material in accordance with this Order and the failure to object to a designation at a given time shall not preclude the filing of a motion at a later date seeking to impose such designation or challenging the propriety thereof. The entry of this Order and/or the production of documents, information and material hereunder shall in no way constitute a waiver of any objection to the furnishing thereof, all such objections being hereby preserved.

24. Any Party knowing or believing that any other Party is in violation of or intends to violate this Order and has raised the question of violation or potential violation with the opposing party and has been unable to resolve the matter by agreement may move the Court for such

relief as may be appropriate in the circumstances. Pending disposition of the motion by the Court, the Party alleged to be in violation of or intending to violate this Order shall discontinue the performance of and/or shall not undertake the further performance of any action alleged to constitute a violation of this Order.

25. Production of DESIGNATED MATERIAL by each of the Parties shall not be deemed a publication of the documents, information and material (or the contents thereof) produced so as to void or make voidable whatever claim the Parties may have as to the proprietary and confidential nature of the documents, information or other material or its contents.

26. Nothing in this Order shall be construed to effect an abrogation, waiver or limitation of any kind on the rights of each of the Parties to assert any applicable discovery or trial privilege.

27. Each of the Parties shall also retain the right to file a motion with the Court (a) to modify this Order to allow disclosure of DESIGNATED MATERIAL to additional persons or entities if reasonably necessary to prepare and present this Action and (b) to apply for additional protection of DESIGNATED MATERIAL.

28. By entering this Order and limiting the disclosure of information in this case, the Court does not intend to preclude another court from finding that information may be relevant and subject to disclosure in another case. Any person or Party subject to this Order who becomes subject to a motion to disclose another party's information designated "CONFIDENTIAL," "RESTRICTED -- ATTORNEYS' EYES ONLY," or "RESTRICTED CONFIDENTIAL SOURCE CODE" pursuant to this Order shall promptly notify that Party of the motion so that the Party may have an opportunity to appear and be heard on whether that information should be disclosed.

Dated: June 28, 2019

Respectfully submitted,

*/s/ Timothy Devlin*
Timothy Devlin (No. 4241)
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Wilmington, DE 19806
Telephone: (302) 449-9010
Facsimile: (302) 353-4251
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*Rein Tech, Inc.*

*/s/ Kenneth L. Dorsney*
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(302) 888-6800
kdorsney@morrisjames.com

*Attorneys for Defendant*
*Mueller Water Products, Inc.*

SO ORDERED this 1st day of July, 2019.

Maryellen Noreika

The Honorable Maryellen Noreika
United States District Judge

**IN THE UNITED STATES DISTRICT COURT**
**FOR THE DISTRICT OF DELAWARE**

| | | |
|---|---|---|
| REIN TECH, INC., | ) | |
| | ) | |
| Plaintiff, | ) | |
| | ) | |
| v. | ) | Civil Action No. 18-cv-1683-MN |
| | ) | |
| MUELLER SYSTEMS LLC, | ) | |
| | ) | |
| Defendant. | ) | |

**APPENDIX A**
**UNDERTAKING OF EXPERTS OR CONSULTANTS REGARDING PROTECTIVE ORDER**

I, _____, declare that:

1. My address is _____.

   My current employer is _____.

   My current occupation is _____.

2. I have received a copy of the Protective Order in this action. I have carefully read and understand the provisions of the Protective Order.

3. I will comply with all of the provisions of the Protective Order. I will hold in confidence, will not disclose to anyone not qualified under the Protective Order, and will use only for purposes of this action any information designated as "CONFIDENTIAL," "RESTRICTED -- ATTORNEYS' EYES ONLY," or "RESTRICTED CONFIDENTIAL SOURCE CODE" that is disclosed to me.

4. Promptly upon termination of these actions, I will return all documents and things designated as "CONFIDENTIAL," "RESTRICTED -- ATTORNEYS' EYES ONLY," or "RESTRICTED CONFIDENTIAL SOURCE CODE" that came into my possession, and all documents and things that I have prepared relating thereto, to the outside counsel

for the party by whom I am employed.

5. I hereby submit to the jurisdiction of this Court for the purpose of enforcement of the Protective Order in this action.

I declare under penalty of perjury that the foregoing is true and correct.

Signature _____

Date _____

# EXHIBIT B

# 2025 Profit Corporation Annual Report

Due on or Before: January 1, 2025
ID: 2012-000614112
State of Formation: Wyoming
License Tax Paid: $60.00
AR Number: 10737924

For Office Use Only
Wyoming Secretary of State
Herschler Bldg East, Ste.100 & 101, Cheyenne, WY 82002-0020
307-777-7311
https://wyobiz.wyo.gov/Business/AnnualReport.aspx

**REIN Tech, Inc.**

1: Mailing Address
1712 Pioneer Ave. Ste 5596
Cheyenne, WY 82001

*Current Registered Agent:*
Wyoming Corporate Services, Inc.
1712 Pioneer Ave Ste 101
Cheyenne, WY 82001

• Please review the current Registered Agent information and, if it needs to be changed or updated, complete the appropriate form available from the Secretary of State's website at https://sos.wyo.gov

2: Principal Office Address
1712 Pioneer Ave. Ste 5596
Cheyenne, WY 82001

Phone: (307) 632-3333
Email: tax@wyomingcompany.com

3: Officers and Directors
President / Director Michael Klicpera - 1712 Pioneer Ave Ste 5596 Cheyenne, WY 82001

I hereby certify under the penalty of perjury that the information I am submitting is true and correct to the best of my knowledge.

| L. Moore (Authorized Agent) | L. Moore (Authorized Agent) | December 6, 2024 |
|---|---|---|
| Signature of Treasurer or Fiscal Agent | Printed Name of Treasurer or Fiscal Agent | Date |

**The fee is $60 or two-tenths of one mill on the dollar ($.0002), whichever is greater.**

**Instructions:**
1. Complete the required worksheet;
2. Sign and date this form; and
3. Return both the form and worksheet to the Secretary of State at the address provided above.

# EXHIBIT C

US011549837B2

(12) **United States Patent**
**Klicpera**

(10) **Patent No.: US 11,549,837 B2**
(45) **Date of Patent: Jan. 10, 2023**

(54) **WATER METER AND LEAK DETECTION SYSTEM**

(71) Applicant: **Michael Edward Klicpera**, La Jolla, CA (US)

(72) Inventor: **Michael Edward Klicpera**, La Jolla, CA (US)

( * ) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **16/356,870**

(22) Filed: **Mar. 18, 2019**

(65) **Prior Publication Data**

US 2019/0234786 A1 Aug. 1, 2019

**Related U.S. Application Data**

(63) Continuation-in-part of application No. 15/016,178, filed on Feb. 4, 2016, now Pat. No. 10,410,501.

(60) Provisional application No. 62/795,529, filed on Jan. 22, 2019, provisional application No. 62/646,339, filed on Mar. 21, 2018.

(51) **Int. Cl.**

| | |
|---|---|
| ***G01M 3/26*** | (2006.01) |
| ***G01F 15/063*** | (2022.01) |
| ***G01F 15/02*** | (2006.01) |

(52) **U.S. Cl.**

CPC ..... ***G01F 15/063*** (2013.01); ***G01F 15/022*** (2013.01); ***G01M 3/26*** (2013.01)

(58) **Field of Classification Search**

CPC ..... E03B 7/071; E03B 7/003; E03B 7/12; E03B 7/10; E03B 7/072; E03B 7/07; G01F 25/0007; G01F 25/00; F16K 31/02; F16K 31/002; G06Q 50/06

See application file for complete search history.

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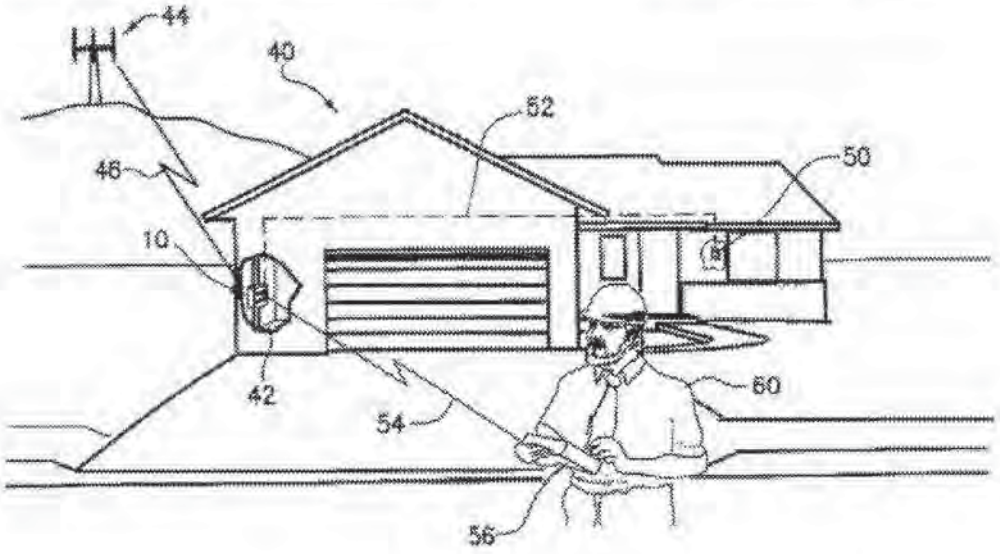
*Primary Examiner* — Benyam Haile
(74) *Attorney, Agent, or Firm* — Michael E. Klicpera

(57) **ABSTRACT**

The present invention is a water meter and leak detection system that has a private or public property(ies) facility water supply interruption system. The system is comprised of a water meter collection node system with shut-off/on mechanism that has wireless Bluetooth, Bluetooth low energy, Zigbee, Z-wave LoRa, Wi-Fi, radio frequency and cellular technology with a private or corporate network, or internet connection that transfer water parameter data to a remote computer or server. Or the system can consist of a water meter collection node that communicates by Bluetooth, Bluetooth low energy, Zigbee, Z-wave LoRa, Wi-Fi, radio frequency and cellular technology with a data communication hub whereby the communication hub is in wired or wireless communication with an internet router that communicates with an internet connection, or with a private or commercial network system, to a remote computer/server or a cloud-computing commercial service.

**51 Claims, 13 Drawing Sheets**



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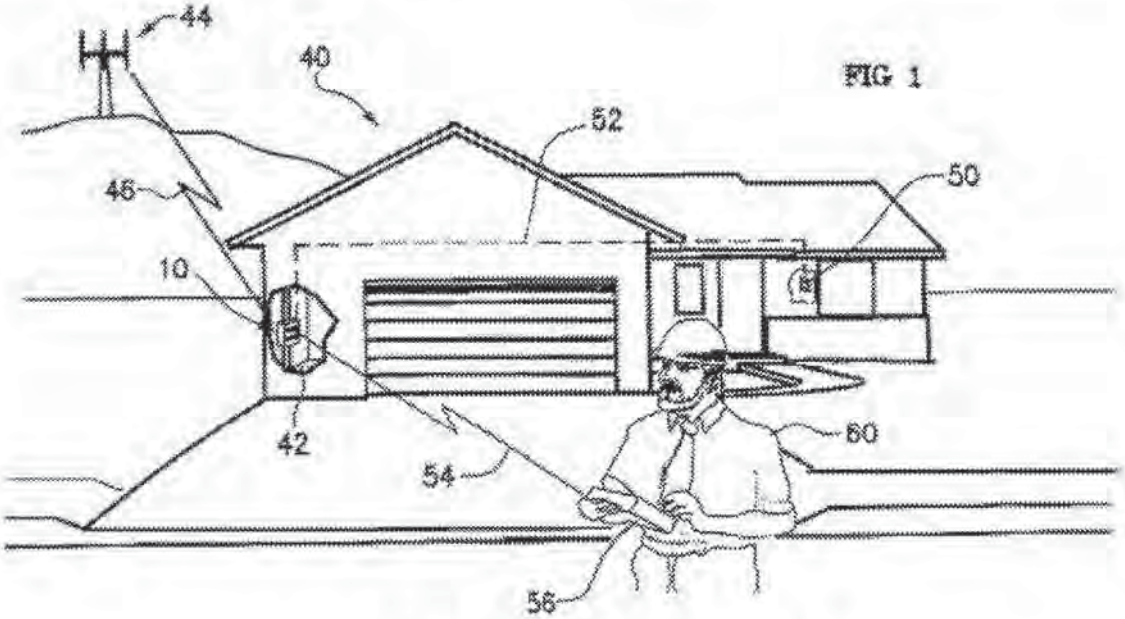
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FIG 1

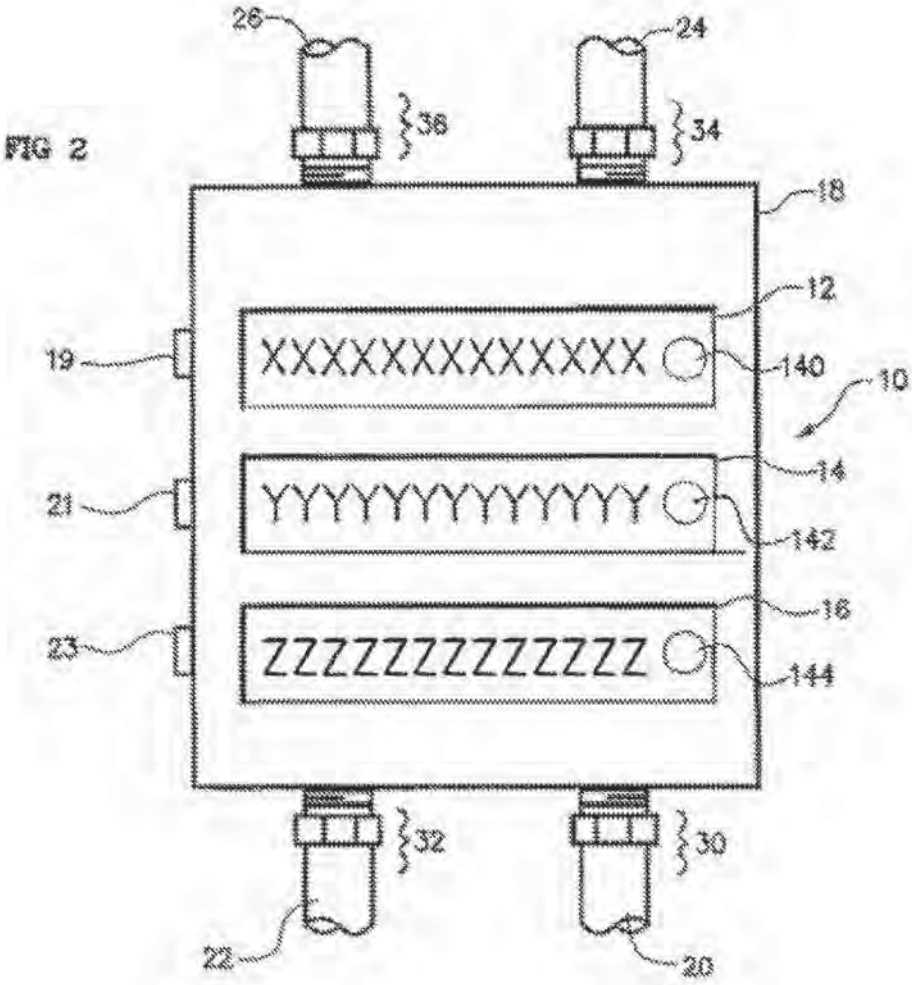
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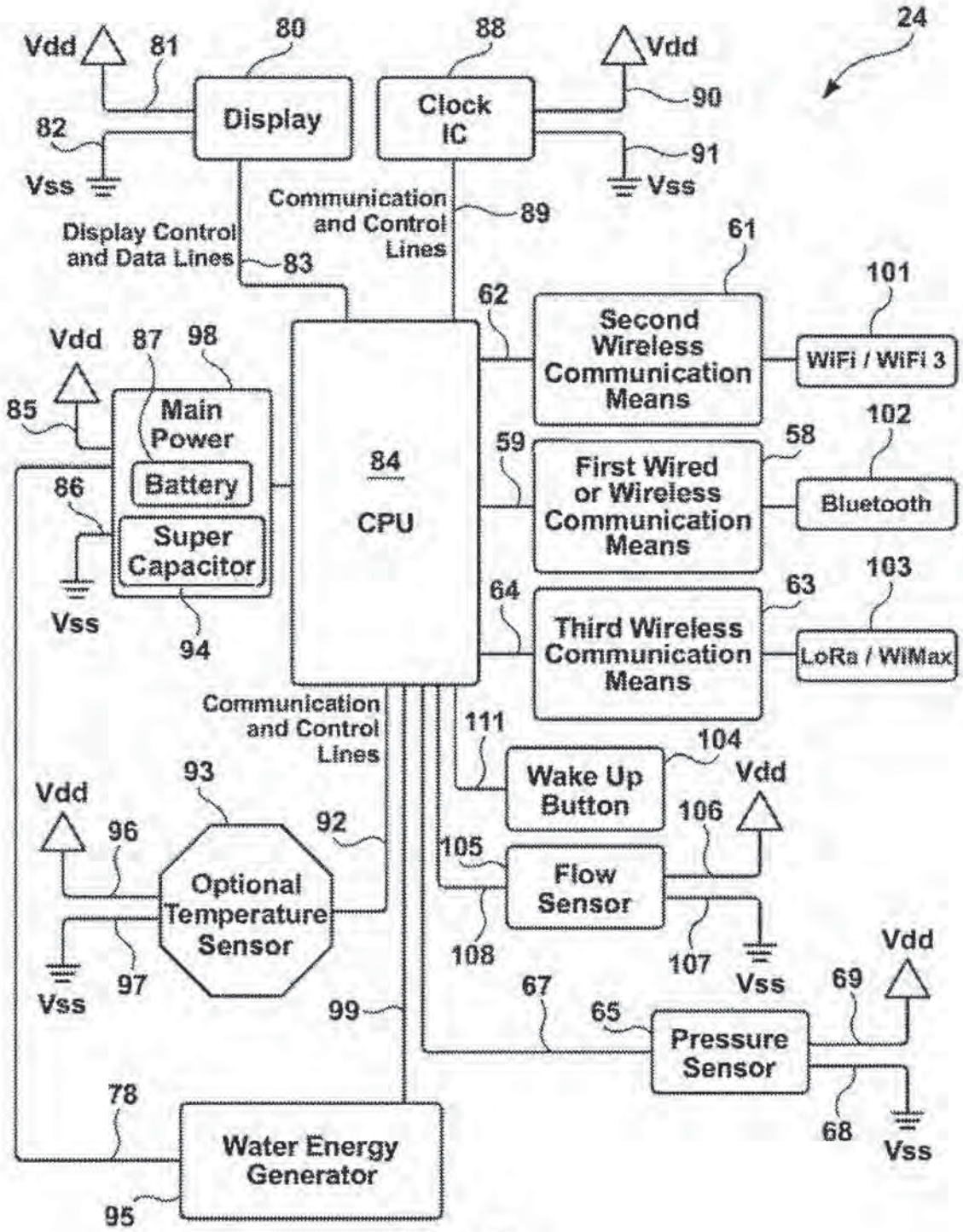
FIG 2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Vss
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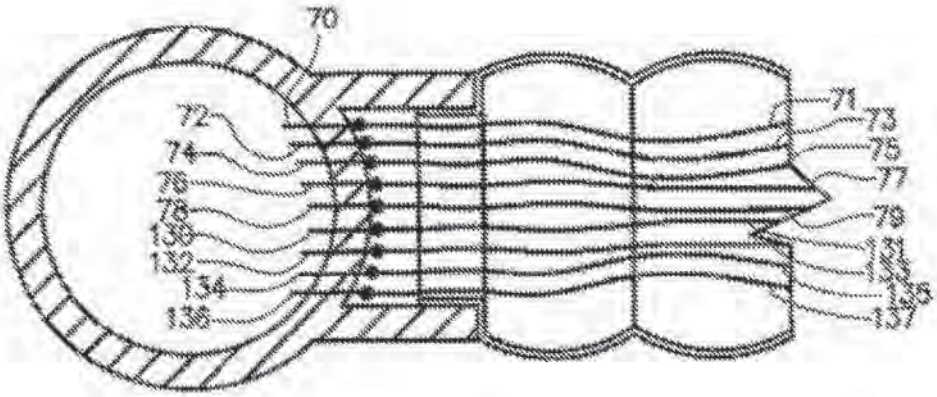
Display Control and Data Lines
83
61
101
62
Second Wireless Communication Means
WiFi / WiFi 3
Vdd
87
98
85
Main Power
Battery
86
Super Capacitor
Vss
94
84
CPU
59
First Wired or Wireless Communication Means
58
102
Bluetooth
64
Third Wireless Communication Means
63
103
LoRa / WiMax
Communication and Control Lines
111
104
Wake Up Button
Vdd
106
105
Flow Sensor
108
107
Vss
Vdd
93
92
96
Optional Temperature Sensor
97
Vss
99
67
65
Pressure Sensor
69
Vdd
68
Vss
78
Water Energy Generator
95

FIG. 3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137

FIG. 4

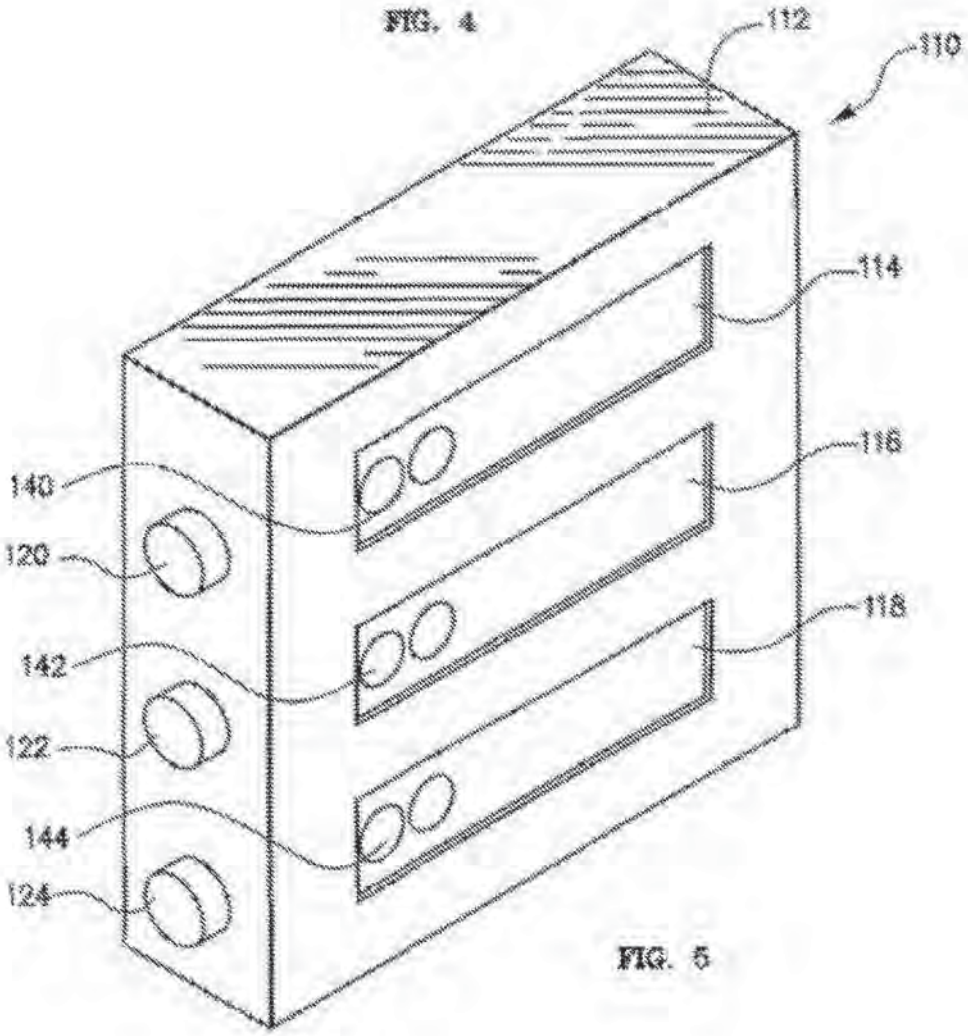
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FIG. 5

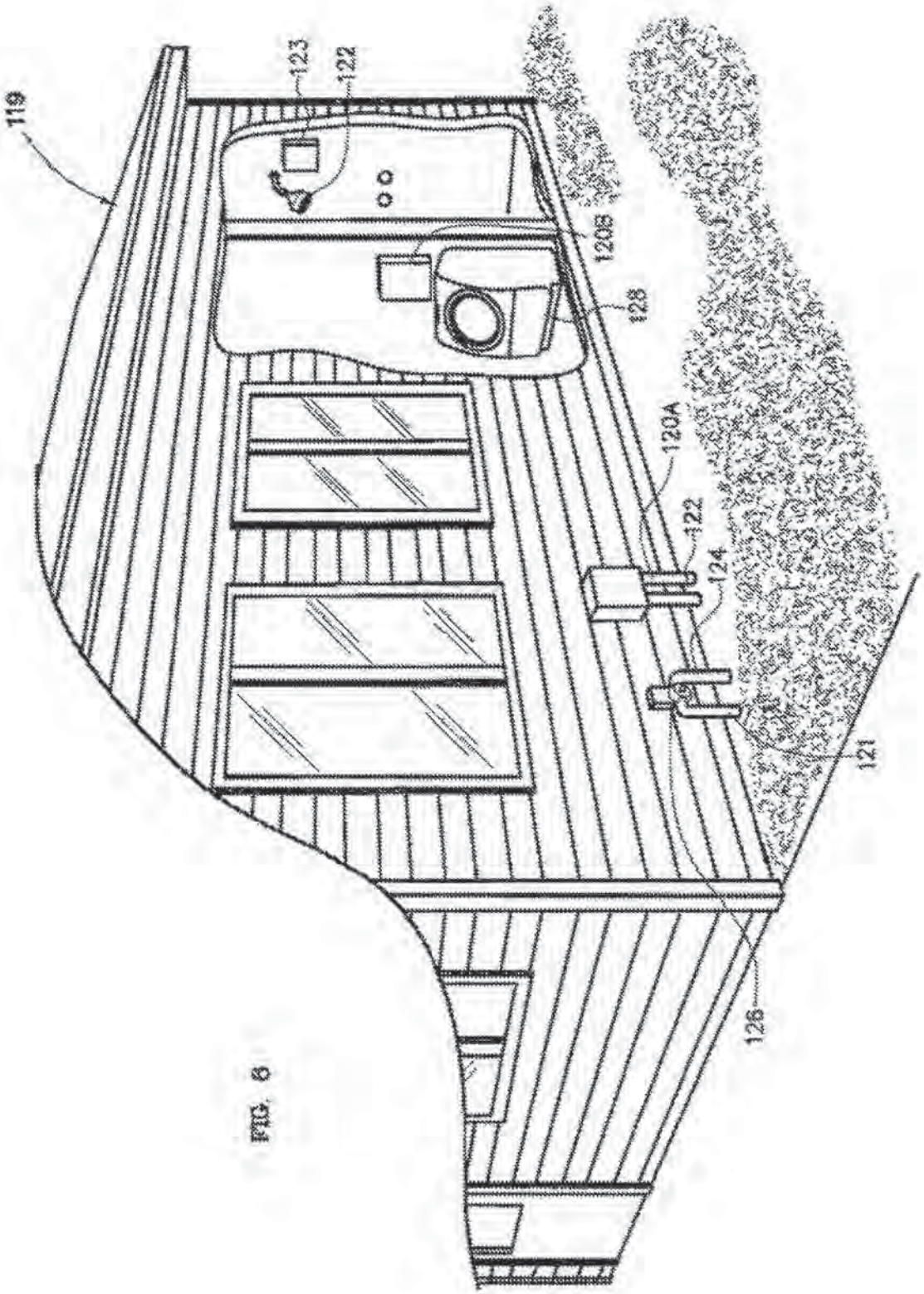
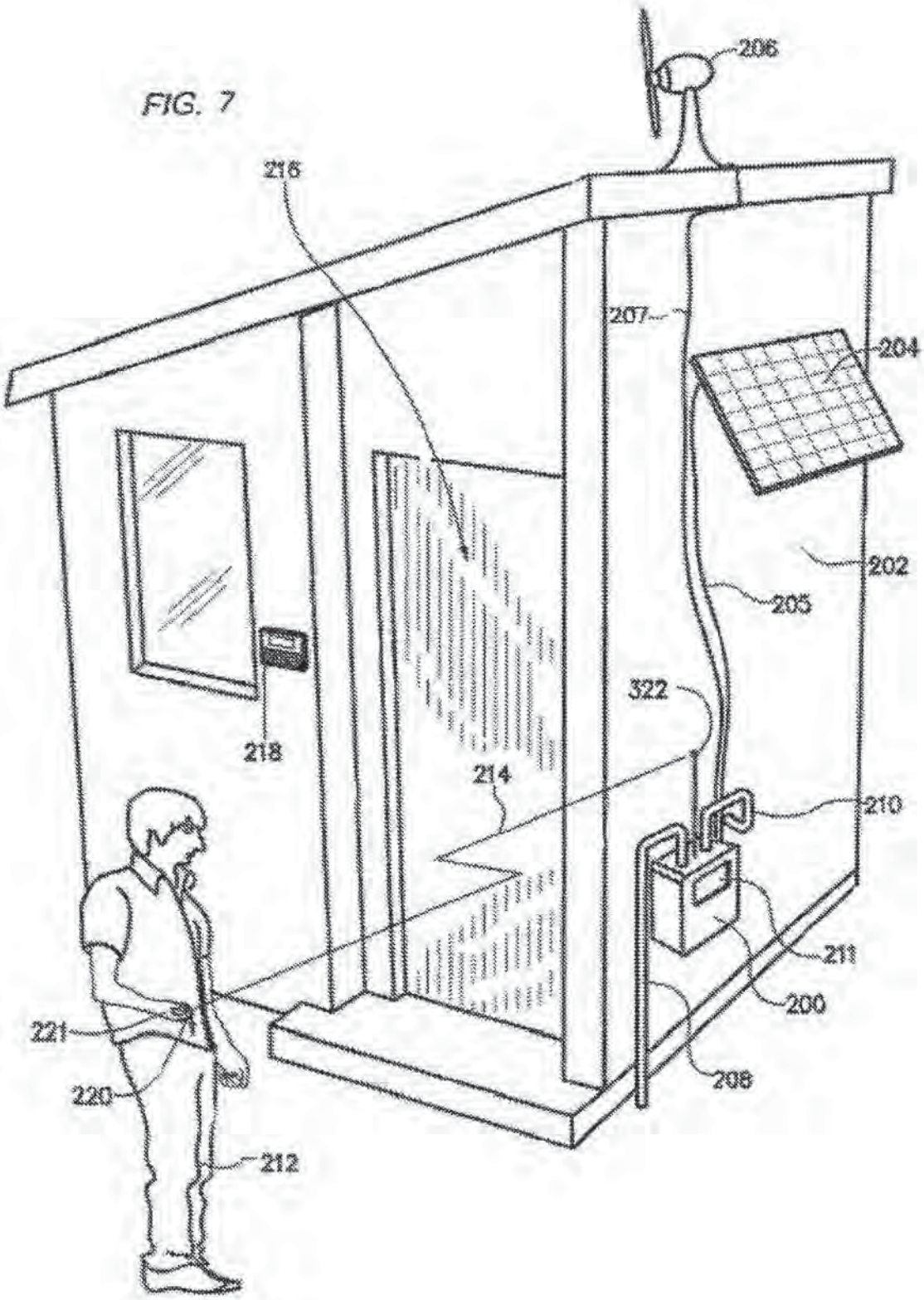
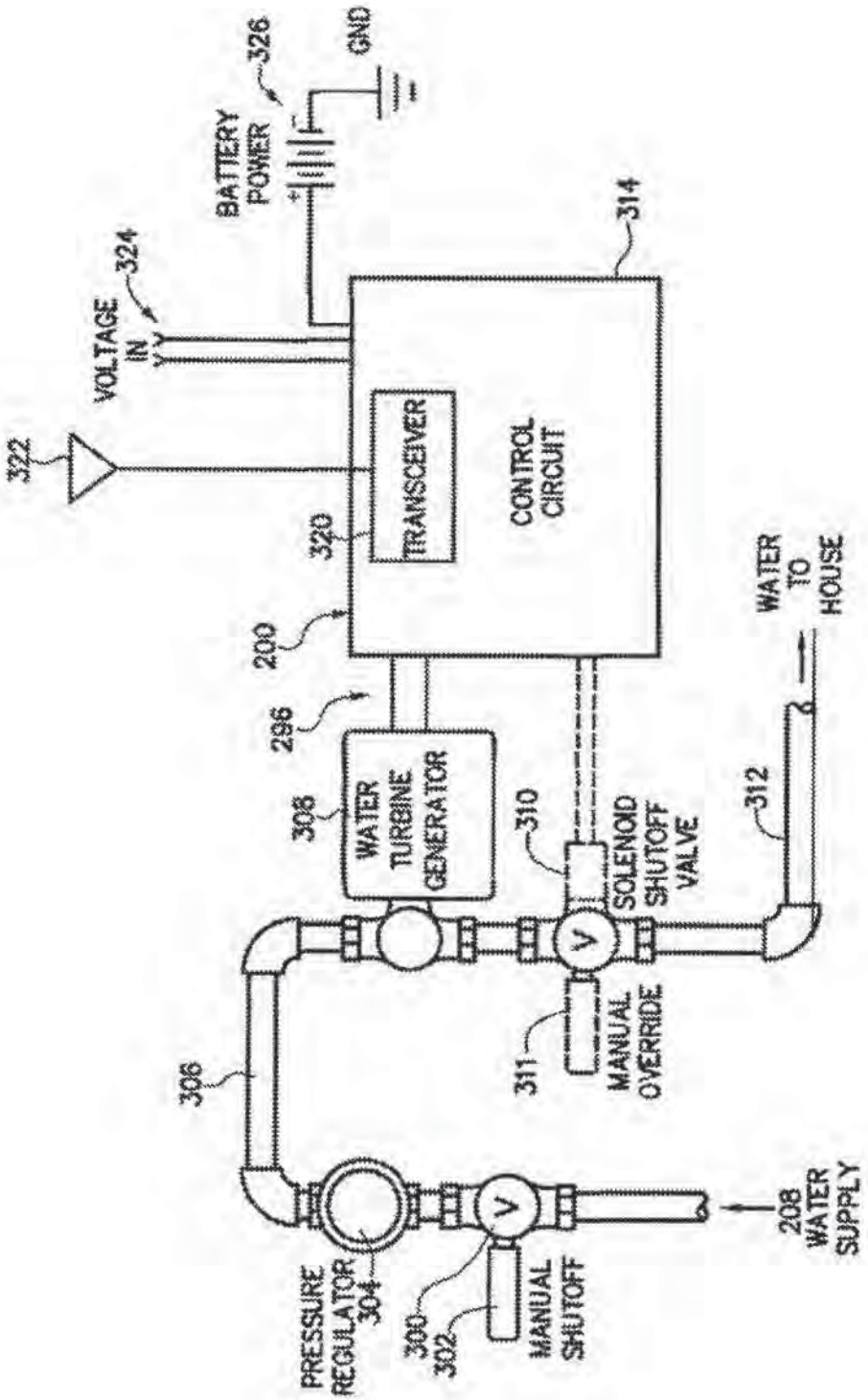



FIG. 6

FIG. 7

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GND
BATTERY POWER
314
324
VOLTAGE IN
Y Y
322
TRANSCEIVER
CONTROL CIRCUIT
320
200
WATER TO HOUSE
296
308
WATER TURBINE GENERATOR
310
SOLENOID SHUTOFF VALVE
312
311
MANUAL OVERRIDE
306
208 WATER SUPPLY
PRESSURE REGULATOR 304
300
302
MANUAL SHUTOFF

FIG. 8

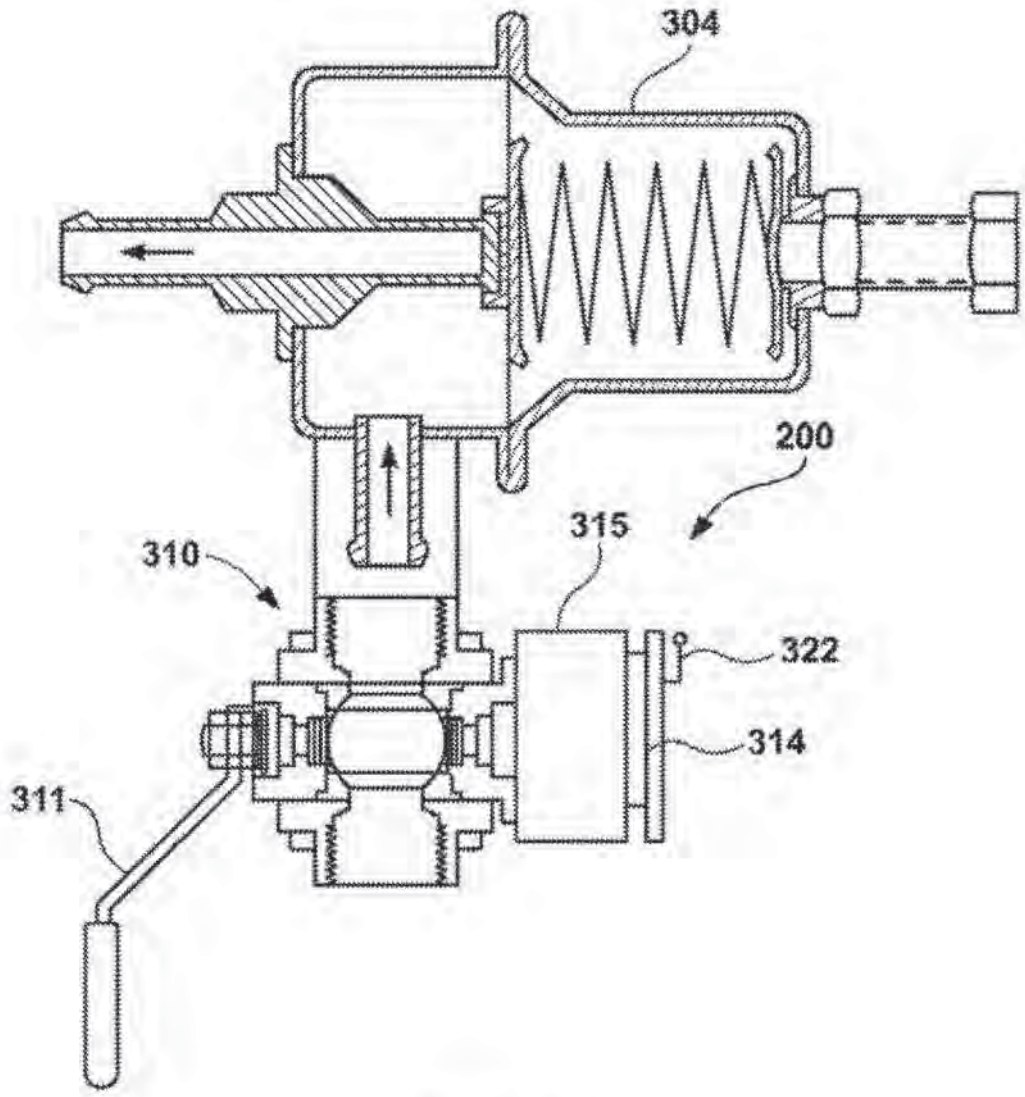



FIG. 9

**Water Use**

Average Time: 10 minutes

Average Water Use: 25 gallons / minute

Average Cost: $ 2.00 / 1000 gallons

**Water Heater Use**

Energy Type: Natural Gas

State: California

Cost: $ 1.789 per therm

Efficiency: .927

Water Temp: 55 °F

Temperature: Hot

115 °F

FIG. 10

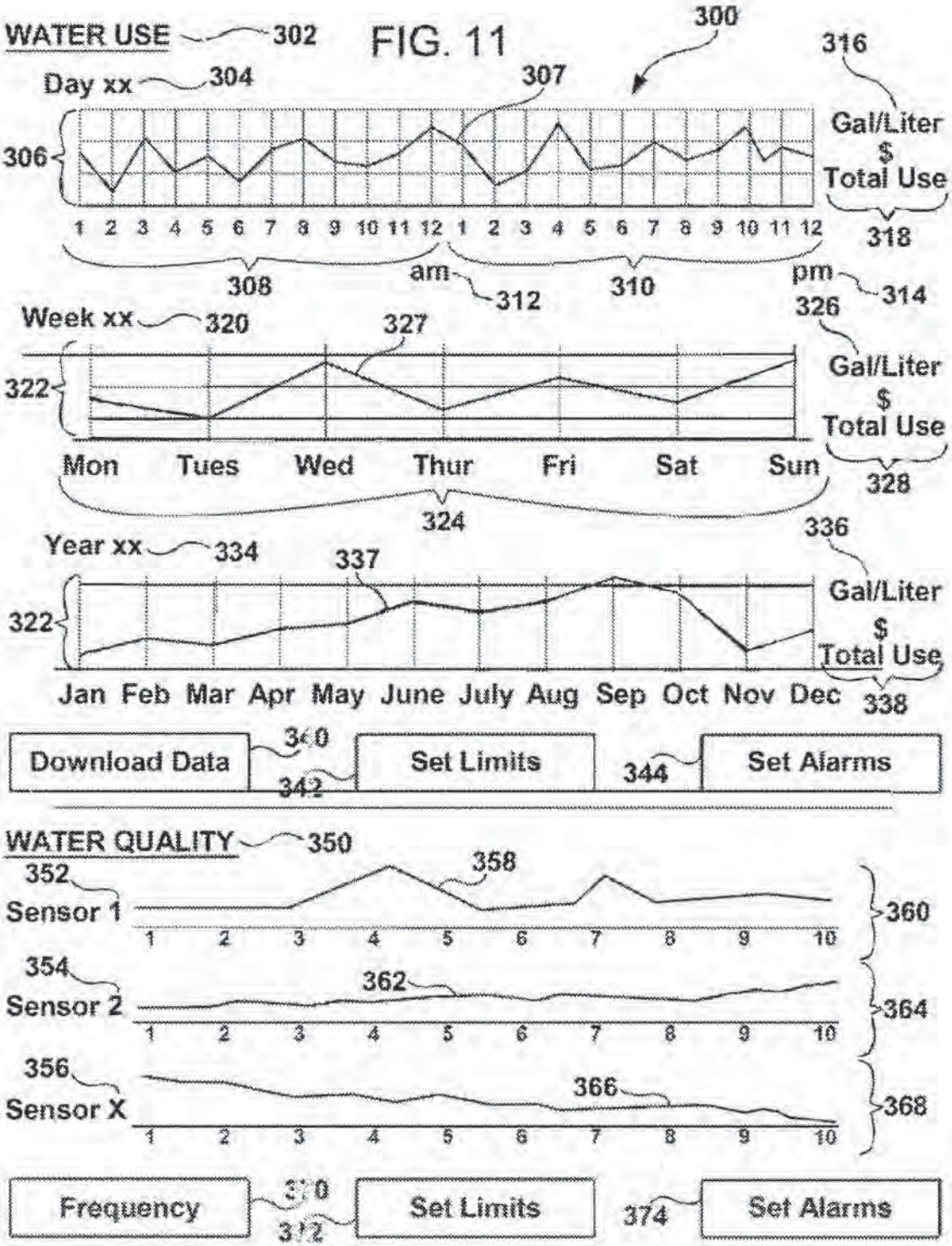
**Water Use (gallons)**

| | Day | Week | Month | Year | Five Year |
|---|---|---|---|---|---|
| Water | 25 | 175 | 750 | 9125 | 45625 |
| Energy | 0.194 | 1.359 | 5.824 | 70.858 | 354.290 |

**Water Cost**

| | Day | Week | Month | Year | Five Year |
|---|---|---|---|---|---|
| Water | $0.05 | $0.35 | $1.50 | $18.25 | $91.25 |
| Energy | $0.23 | $1.60 | $6.87 | $83.54 | $417.71 |
| Total | $0.28 | $1.95 | $8.37 | $101.79 | $508.96 |

FIG. 11


WATER USE
302
300
316
Day xx
304
307
306
Gal/Liter
$
Total Use
318
1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12
308
am
312
310
pm
314
Week xx
320
327
326
322
Gal/Liter
$
Total Use
328
Mon Tues Wed Thur Fri Sat Sun
324
Year xx
334
337
336
322
Gal/Liter
$
Total Use
338
Jan Feb Mar Apr May June July Aug Sep Oct Nov Dec
Download Data
340
342
Set Limits
344
Set Alarms
WATER QUALITY
350
352
Sensor 1
358
360
1 2 3 4 5 6 7 8 9 10
354
Sensor 2
362
364
1 2 3 4 5 6 7 8 9 10
356
Sensor X
366
368
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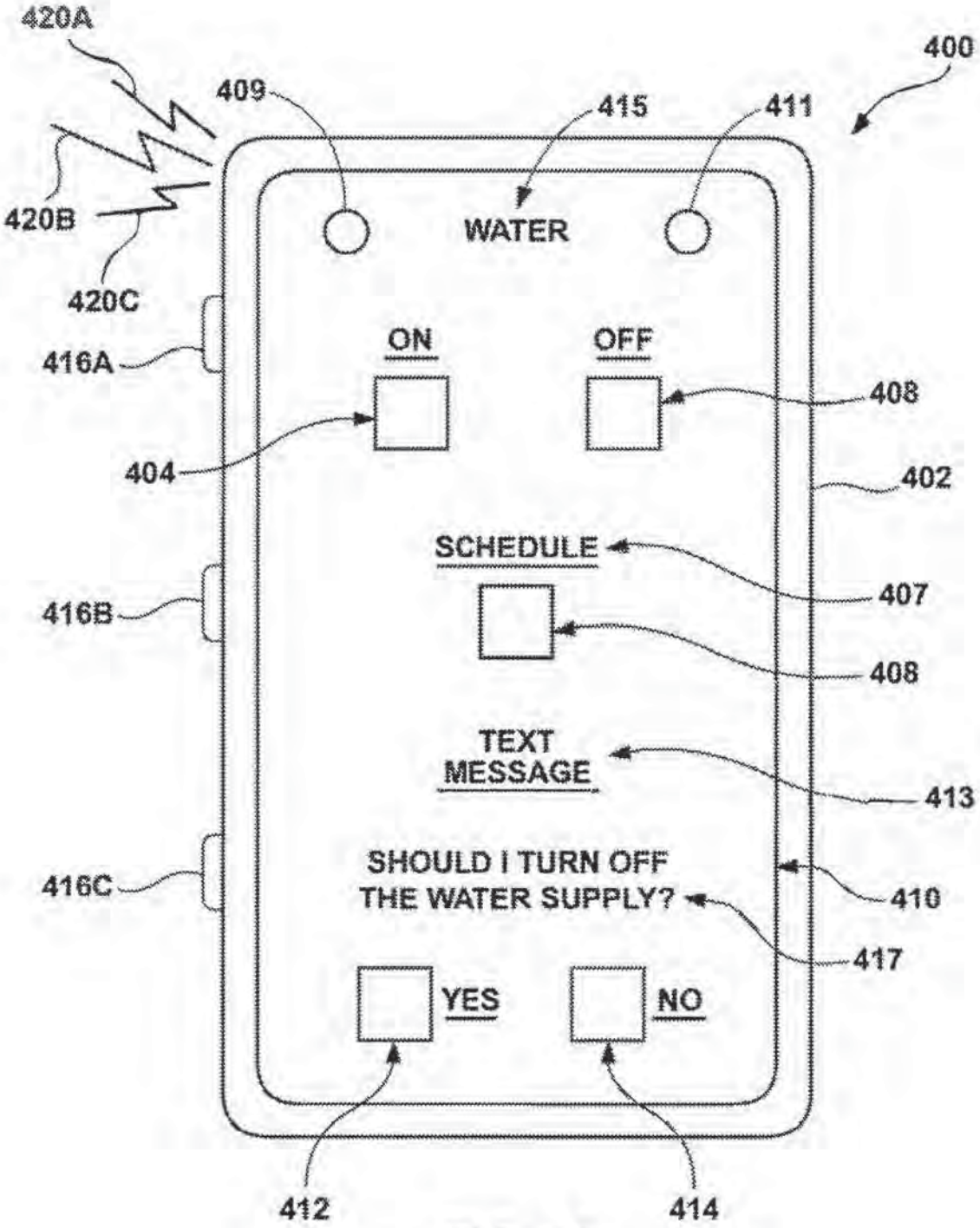
Frequency
370
372
Set Limits
374
Set Alarms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415
411
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WATER
420C
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OFF
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408
404
402
SCHEDULE
416B
407
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TEXT
MESSAGE
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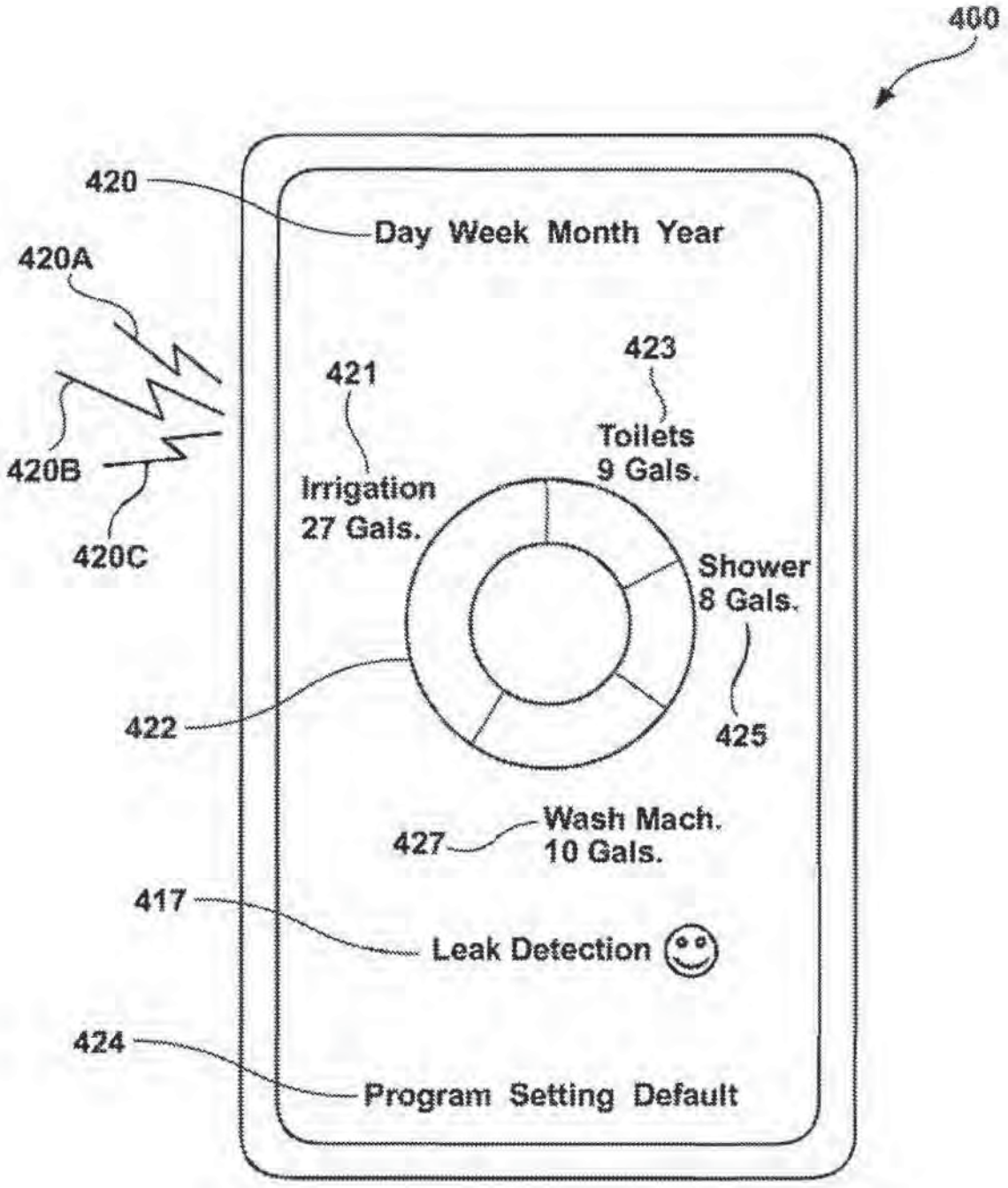
SHOULD I TURN OFF
THE WATER SUPPLY?
416C
410
417
YES
NO
412
414

FIG. 12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Toilets
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Irrigation
27 Gals.
420C
Shower
8 Gals.
422
425
427
Wash Mach.
10 Gals.
417
Leak Detection
424
Program Setting Default

FIG. 13

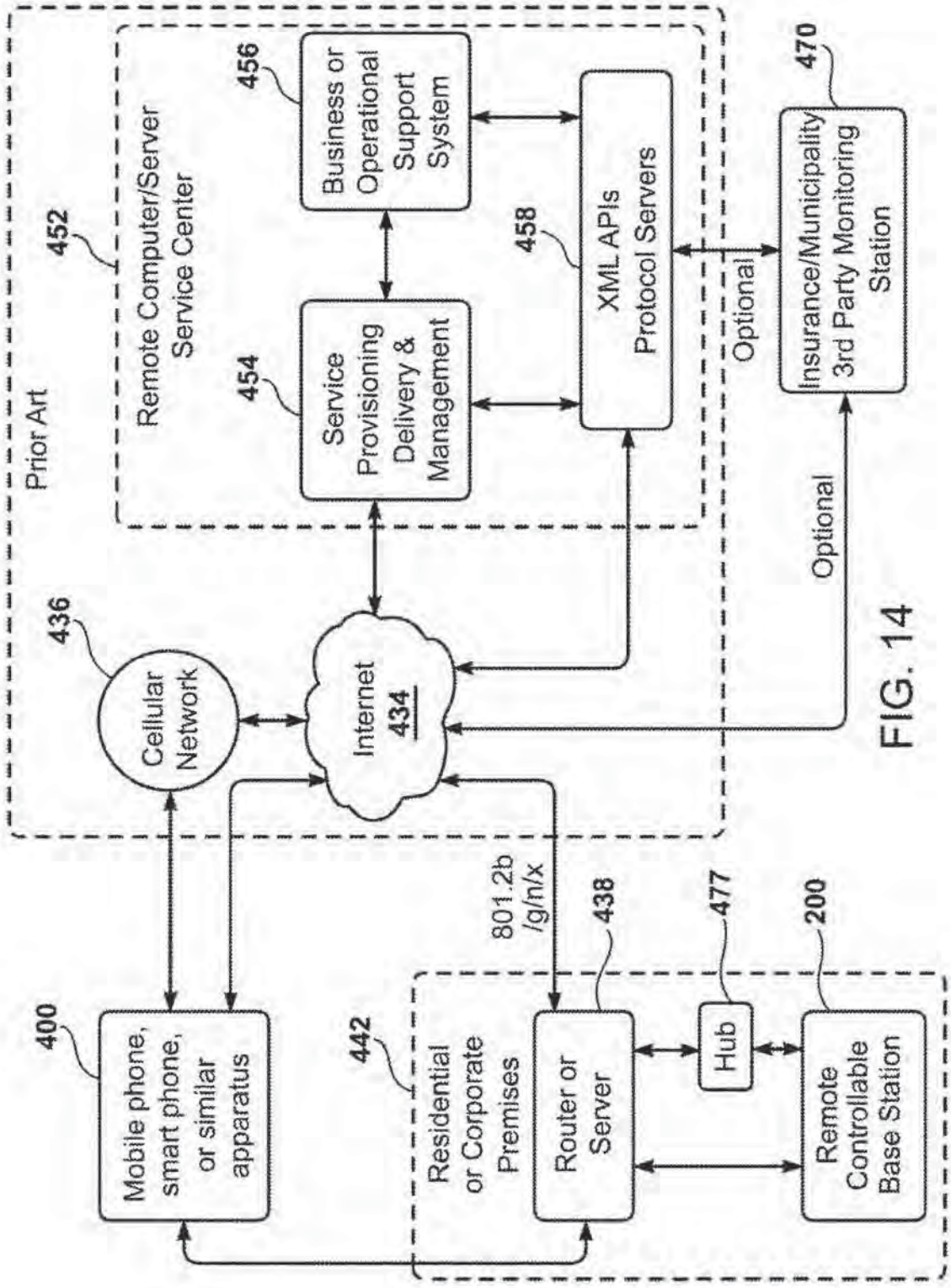
Prior Art
452
Remote Computer/Server Service Center
456
Business or Operational Support System
458
XML APIs Protocol Servers
454
Service Provisioning Delivery & Management
Optional
470
Insurance/Municipality 3rd Party Monitoring Station
436
Cellular Network
Internet 434
Optional
801.2b /g/n/x
438
477
200
400
442
Mobile phone, smart phone, or similar apparatus
Residential or Corporate Premises
Router or Server
Hub
Remote Controllable Base Station

FIG. 14

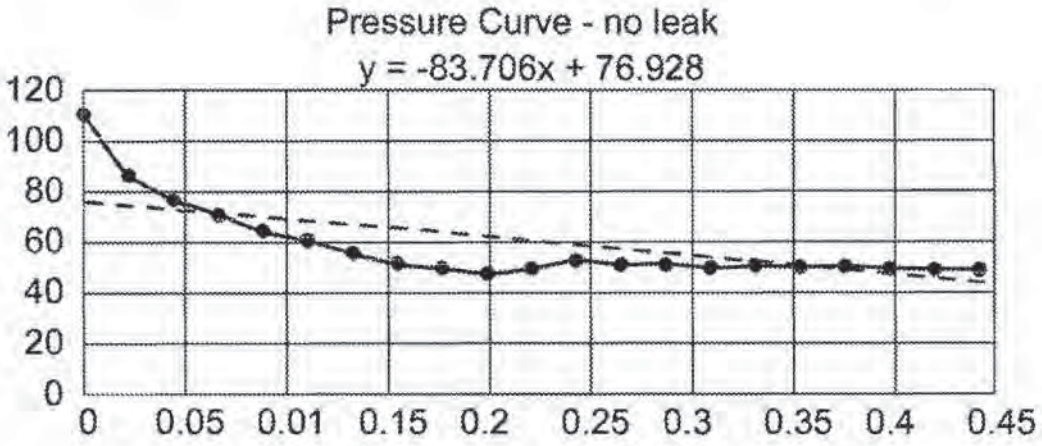


Fig. 15A

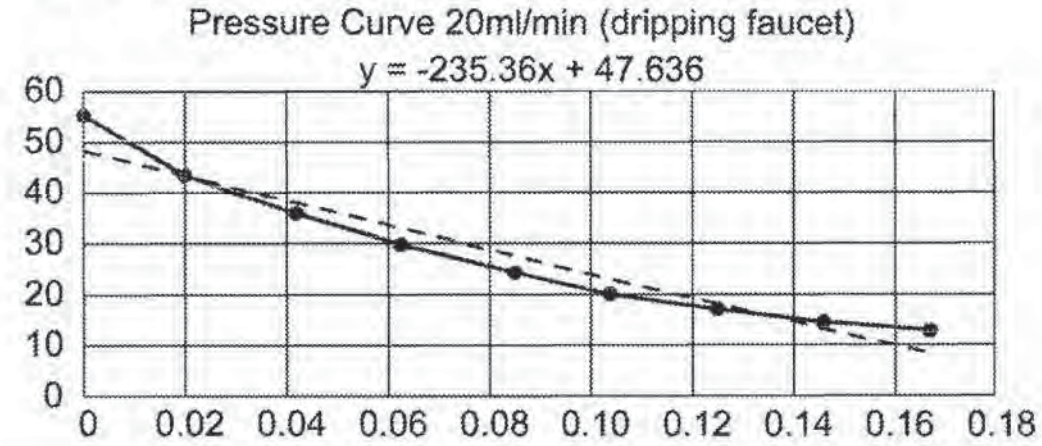


Fig. 15B

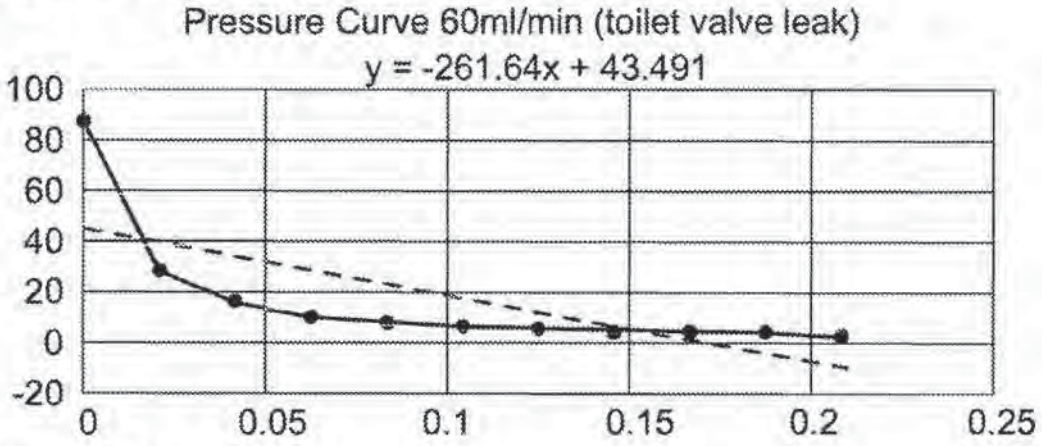


Fig. 15C

# WATER METER AND LEAK DETECTION SYSTEM

## RELATED APPLICATIONS

This application is a continuation-in-part of U.S. patent application Ser. No. 15/061,178 filed on Feb. 4, 2016 and is incorporated herein by this reference. This Applicant claims priority from Provisional Patent Application No. 62/646,339 filed on Mar. 21, 2018 entitled "Water Meter and Leak Detection System" and Provisional Patent Application No. 62/795,529 filed on Jan. 22, 2019, both of which are incorporated by reference herein its entirety.

## FIELD OF THE INVENTION

This apparatus and the method of use relates to water supply systems. More particularly, the invention relates to a water meter and leak detection system for private and/or public property(ies) to monitor and provide water use and water leak information and to minimize water loss and related damage.

## BACKGROUND OF THE INVENTION

Water is increasingly becoming a precious resource. While fresh water supplies have been challenged due to climate (short rainy seasons and long droughts) and increased pollution, water demand has been rising due to the growing population along with increased development. The increasingly limited supply of fresh water is a humanitarian concern and water conservation is becoming a major issue for many communities. An apparatus for real-time monitoring of water use and real-time detection of leak conditions at private and/or public property(ies) (e.g., residential structures and yards, business/industrial/commercial facilities, and governmental/institutional sites) can be useful in assessing and controlling water resources and supporting water conservation.

Water losses to private and/or public properties caused by broken or compromised water pipes and by unobserved leaks are enormous. Broken or compromised water pipes are often underground and are undetected, or, for example, when the property owner is absent or sleeping, and the resulting water loss and property damage can be catastrophic. Property insurance agencies report that a significant portion of total insurance losses are water related. It has been found that losses due to water leaks in residential homes amount to a significant percentage of the total water use.

## SUMMARY OF THE INVENTION

The water meter and leak detection System monitors real-time water use and provides real-time leak detection with notification for private and/or public property(ies) (e.g., residential structures and yards, business/industrial/commercial facilities, and/or governmental/institutional sites). The water meter and leak detection system connects in series to the water supply for one or more private and/or public properties. This invention comprises a water meter collection node and an optional communication hub or receiving station. The collection node is essentially a water meter which can include: one or more water flow rate sensors, one or more optional control valves, one or more optional temperature sensors, one or more optional pressures sensors, one or more optional acoustic sensors, and wireless radio technology. Use of the optional communication hub or



receiving station provides longer wireless range capability. The water meter collection node with or without the optional communication hub or receiving station can utilize long range wireless technology [LoRa, Sigfox, WiMAX, Ultra Narrow Band (UNB), 6LoWPAN, standard WiFi and WiFi3 (with Wi-Fi extenders)], limited range technology [Bluetooth, Bluetooth low energy (BLE), Zigbee and Z-wave], other wireless technology, wired and wired technology [X10, universal powerline bus (UPB), HART Communications Protocol], established cellular technology [3GPP, LTE-M, NB-IoT, and 5G], and any combinations thereof.

In one embodiment, the water meter collection node utilizes a LoRa, WIMAX, 6LoWPAN, ultra narrow band (UNB), or NB-IoT radio that communications with the optional communication hub or receiving station that has a corresponding LoRa, WiMAX, 6LoWPAN, ultra narrow band (UNB), or NB-IoT radio that communications with the collection node, and the optional communication hub has a second radio with a Wi-Fi or Wi-Fi3 technology that communicates with a wireless router. In addition, the communication hub can be hard-wired to a wireless router using the ethernet ports. Bluetooth, Bluetooth low energy {BLE}, Zigbee or Z-Wave can also be used for shorter range communications. The wireless communication technology can utilize and communicate with an application programming interface (API) protocol, a simple object access protocol (SOAP), a representational state transfer (REST} protocol, or another API technology. The API interface is software code that allows two programs to efficiently communicate with each other for website presentation. The wireless technology is in duplex format as water use monitoring transmits water use data to a remote server while the leak detection capability needs to send a signal to control the water control valve. The long range wireless technology (LoRa, Sigfox, WiMAX, UNB, 6LoWPAN, NB-IoT, standard Wi-Fi and Wi-Fi3 (with Wi-Fi extenders), limited range technology (Bluetooth, BLE, Zigbee and Z-wave), wired technology (X10, UPS, HART Communications Protocol), established cellular technology (3GPP, NB-IoT, LTE-M), and any combinations thereof transfers data through a private or corporate network system or through a router connected to the internet. These methods of transfer communicate water use, water leaks, and/or water quality data to remote server(s) with database(es) The water meter and leak detection system is connected to the water supply piping using a continuous, water flow event use (basis), or on a demand basis for monitoring water use from the main water supply line used within a private and/or public property{ies}. The present invention can be used with private and/or public water sources such as public municipalities and/or private wells and other non-municipal related water sources. The remote server and database can be used to support a computer portal that designated or registered users or owners can access water use data and/or leak detection information on a cell or smart phones, computers, or similar apparatuses can use to access and observe water use, leak conditions, and/or water quality parameters for relevant private and/or public property(ies).

The housing of the water meter and leak detection system collection node and optional communication hub or receiving station can be fabricated from materials and can use technologies that provide protection for moist and wet conditions, hot environments and cold/freezing situations. The water meter and leak detection system includes a central processing unit (CPU), microprocessor and/or microcontroller, data storage, timing and wireless circuitry, water flow rate sensors, optional water quality sensors, optional pres-

sure sensors, optional acoustic sensors, and a power generation means. The types of water flow rate sensor(s) can be invasive (i.e. within water pipe; e.g. turbine sensor), non-invasive (i.e. outside water pipe; e.g. ultrasonic sensor), and/or sensitive water flow sensors (e.g. pressure sensor). The water meter and leak detection system has the capability to utilize several different sensors to accomplish the goals of real-time monitoring water use and detecting leaks. Furthermore, the water meter and leak detection system can monitor separately indoor and outdoor water use or can monitor one or more designated areas of one or more sites. Optionally, a temperature sensor can be incorporated into the water meter collection node to determine, communicate, and address temperature conditions, e.g. assess freezing conditions (water temperature is approaching 32 degrees Fahrenheit or 0 degrees Celsius) and communicate with the property structure's thermostat or heating system to maintain a specified temperature within the structure, drain water from pipes, and/or perform other damage protection techniques. The optional pressure sensor, with associated use of the control valve, can be used for detecting [very] extremely small leaks. This is accomplished by shutting off the water supply with the control valve and monitor pressure over time. The resulting loss of pressure can generate graphical curves or charts that demonstrate that type of small leak, e.g. leaking faucet, leaking toilet flapper valve. The pressure sensor can also be used to detect pressure fluctuations during standard flow conditions.

The water meter and leak detection system with control valve(s) can be shut-off/on manually or be programmed to automatically turn off the water control mechanism, when a leak is detected, or program for a schedule using a cell or smart phone, computer, or other electronic apparatus. The water meter and leak detection system can be programmed to follow a work, vacation, leak monitoring or other schedule. The water meter and leak detection system can be set to automatically shut-off when the private and/or public property{ies) is unoccupied or vacant. The occupancy of the private and/or public property(ies) can be determined by feedback from electronic lock{s), passive infrared sensor(s) (PIRs), alarm(s), security system(s), or other security devices. Furthermore, the water meter and leak detection system is designed with electrical and communication circuitry to send a signal to the cell or smart phone, computer, or other electronic apparatus that the water supply line is on or off.

The water meter and leak detection system provides wireless remote leak detection notification using water event or water event basis monitoring and software analysis. Alternately, continuous data monitoring can be stored in a data module in the water meter collection node and periodically transferred wirelessly to a remote computer or server as described herein. The water meter and leak detection system monitors water use and detects non-typical, abnormal, or continuous water use and alerts, signals, or messages via a cell or smart phone, computer, or other electronic apparatus to one or more property owners, users, or responsible individuals of any water leak condition(s). Thus, leak notification can be provided when the property (ies) is vacated or unsupervised.

The water meter and leak detection system's collection node communicates through a private or commercial network system or communicates with the optional communication hub or receiving station and through a router to the internet.

The water meter and leak detection system's collection node with water shut-off/on mechanism can be battery operated and can utilize re-chargeable batteries or super capacitators. The re-chargeable components can be connected to electricity generation means such as a water turbine generator(s), solar cell(s), or wind generation means to supplement electrical energy. The Water Meter and Leak Detection System with shut-off/on mechanism can also be AC or DC powered.

Finally, many other features, objects and advantages of the present invention will be apparent to those of ordinary skill in the relevant arts, especially considering the following discussions, drawings, detailed descriptions and claims.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is an illustration of the embodiment comprising a water meter and leak detection system connected in series to the water supply piping to monitor water use and detect leak(s) for an example property, a residential structure. FIG. **1** also shows several methods of wireless capability for the water meter and leak detection system to communicate water use and leak detection information to a conveniently located cell or smart phone, computer, or similar apparatus. FIG. **1** shows wireless communication for the property owner and/or municipal representative using a custom display/recorder for a governmental, civil, commercial or municipal operators or agencies. In one example, FIG. **1** shows a wireless means for communicating directly to a home owner, or offsite central monitoring computer using long range wireless technology and/or telephone lines via satellite, microwave technology, the internet, cell tower, telephone lines, and other similar technology.

FIG. **2** is a front illustration of an optional display on the water meter and leak detection system showing input and output of a water supplies lines with a display means having one or more display screens and a plurality of hardware and/or software buttons. FIG. **2** shows a hot-water and a cold/ambient water input and a hot water and cold/ambient water output for monitoring hot and cold water (water energy). But FIG. **2** also represents (but not shown) a single cold or ambient water input and a cold or ambient water output.

FIG. **3** is an electrical schematic showing the main power, CPU or microcontroller, the analog or digital optional display means, the clock circuit, one or more flow sensors, optional temperature sensor, optional pressure sensor and/or water quality sensor(s), and optional water energy generator, and a first, second and/or third wireless communication technology for data transfer through either a private or public network system and/or the optional collection hub to an internet router. Similar electronic circuitry without the sensors can be used with the optional communication hub.

FIG. **4** is a cross-section illustration showing a plurality of water flow and water quality parameter sensors located in relative positions within the water supply line lumen and the connecting wires.

FIG. **5** is an illustration of an optional custom wireless display/recording remote apparatus having a plurality of display means and a plurality of software controlling buttons.

FIG. **6** is an illustration of a plurality of water parameter transceivers attached to various locations for monitoring water use.

FIG. **7** is an illustration of the water meter and leak detection system attached to a residential building with wind and solar energy generation and a person having a cell or smart phone, computer, or similar apparatus communicating

with the Water Meter and Leak Detection System for obtaining water parameter data or controlling a water control valve.

FIG. **8** is a more detailed illustration of the water meter collection node with the control circuit, a wireless transceiver, power supply, a water shut-off/on mechanism with a manual control, and water supply plumbing with optional water turbine energy generator that connected in series to the water supply line.

FIG. **9** is another embodiment of the present invention with a detailed illustration of the water shut-off/on mechanism combined with an independent pressure reduction valve and functioning as a combined system consisting of a water meter collection node with one or more water flow sensors having a water shut-off/on mechanism and pressure reduction valve.

FIG. **10** is an illustration of an "APP" or programmed application that provides water use data in various example formats that is transferred from the water meter collection node or with optional communication hub or receiving station to a remote display/recording apparatus, or to a remote computer/server that allows access to a registered user of a cell or smart phone, computer, or similar electronic apparatus.

FIG. **11** is an illustration of another "APP" or programmed application, or another page of an "APP" or programmed application the displays water use data in another format that is transferred from the water meter collection node or with optional communication hub or receiving station to a remote display/recording apparatus, or to a remote computer/server that allows access to a registered user of a cell or smart phone, computer, or similar electronic apparatus.

FIG. **12** is an enlarged illustration of another typical cell or smart phone, computer or similar electronic apparatus having an "APP" or programmed application, or another page of an "APP" or programmed application to display the soft buttons or control activator to turn on/or the water system, program a schedule to control the water shut off/on mechanism, or receive a text message.

FIG. **13** is an illustration of a typical cell or smart phone, computer or similar electronic apparatus having another "APP" or programmed application, or another page of an "APP" or programmed application to display the soft buttons to determine the period for displaying, graphical of water use devices, leak detection graphical item, and programming and settings features.

FIG. **14** is block diagram of the more integrated system showing the software, hardware and applications of the home or corporate premises communicating with the Water Meter and Leak Detection System and communicating with the internet and remote computer services ("the Cloud").

FIG. **15***a* is an illustration of the pressure drop within a typical 3-bedroom residence have copper plumbing wherein there is no leak.

FIG. **15***b* is an illustration of the pressure drop within a typical 3-bedroom residence have copper plumbing wherein the leak is approximately 20 ml/min.

FIG. **15***c* is an illustration of the pressure drop within a typical 3-bedroom residence have copper plumbing wherein the leak is approximately 60 ml/min.

The figures are not intended to be exhaustive or to limit the disclosed technology to the precise form disclosed. It should be understood that the disclosed technology can be practiced with modification and alteration, and that the disclosed technology be limited only by the claims and the equivalents thereof.

## DESCRIPTION OF THE PREFERRED EMBODIMENTS

The following description is non-limiting and is made merely for the purpose of describing the general principles of the disclosed embodiments. Numerous specific details are set forth to provide a full understanding of various aspects of the subject disclosure. It will be apparent, however, to one ordinarily skilled in the art that various aspects of the subject disclosure may be practiced without some of these specific details. In other instances, well-known structures and techniques have not been shown in detail to avoid unnecessarily obscuring the subject disclosure.

Water Use refers to the total volume or volume of water used over a period of time.

Water flow event or water flow event basis is defined as monitoring and sensing the initiation of water flow until the water flow is stopped, whereby the water flow rate, the duration of water flow, and the total water volume can be calculated and recorded. The water flow event will inherently save CPU and wireless transmission energy by not recording or transmitting no water use data and allowing the CPU or microprocessor to go into a sleep mode between each water event use thereby providing a superior method for analyzing water signatures and patterns for reliable discernment of leak and leak locations.

Private and/or public property(ies) refers to the structure(s), site(s), area(s), land(s), and/or location(s) whether indoor, outdoor, or a combination thereof that is/are owned, controlled, used by or designated for use by any type of entity(ies) (i.e. personal, residential, commercial, corporate, business, industrial, establishment, government, administrative, institutional, organizational, etc.). Examples include but are not limited to homes and yards, office buildings, commercial structures and grounds, farming lands, government or institutional facilities, multi-unit apartments, condominiums or townhomes, hospitals, dormitories, university or corporate campuses, water or irrigation system defined areas, water wells, sports fields, exercise facilities, parks, golf courses, home owner association (HOA) areas, and military bases.

Authentication refers to the technology that confirms or ensures that a message(s), control/command signal(s), data, and/or information that is downloaded and/or transferred from one person or device to another that is received only by the intended person or device. One example of an authentication method is the Challenge Handshake Authentication Protocol (CHAP) which provided authentication technology to a user communication with a network entity, which may be any remote private or corporate server and/or the Internet using a service provider (e.g. ATT U-verse, Xfinity/Comcast) CHAP provides users authenticated passwords when accessing remote servers, which also are authenticated prior to allowing the user access. For example, short distance wireless technology Bluetooth, Bluetooth low energy, Zigbee, Z-wave and Wi-Fi short range wireless technologies can be used for an authentication pairing procedure to initially establish remote wireless communications. Such authentication pairing procedure can be inputting a Service Set Identifier (SSID) and password which can include two factor authentication.

In the water meter environment, encryption refers to a privacy technology that uses a process of encoding which prevents any individual mobile communication device or water meter but the intended recipient mobile communication device or water meter to access, download, read, or review a message(s), control/command signal(s), data, and/

or information by providing a confidential transfer between the individual, mobile communication device or water meter one or more sensors transferring data or information to a remote computer or server.

In the water meter context, integrity refers to technology that ensures that a message(s), control/command signal(s), data, and/or information transferred from a water meter to another meshing water meter, or to a remote computer or mobile communication device (cell phone), is not altered, compromised, or corrupted, completely lost or having partially lost segments, during transmission or when accessed or downloaded.

In the water meter environment, non-repudiation refers to the technology that confirms or ensure and prevents a sender or receiver from denying that a message(s), control/command signal(s), data, and/or information was sent or received. Block chain technology is an upcoming technology that will ensure non-repudiation compliance.

Cellular format technology refers to all current and future variants, revisions and generations [e.g. third generation (3G), fourth generation (4G) and 3GPP (and enhancement revisions), fifth generation (5G), 3GPP cellular technology, all future generations of Global System for Mobile Communication (GSM), General Packet Radio Service (GPSR), Code Division Multiple Access (CDMA), Evolution-Data Optimized (EV-DO), Enhanced Data Rates for GSM Evolution (EDGE), 3GSM, Digital Enhanced Cordless Telecommunications (DECT), Digital AMPS (IS-136/TDMA, Integrated Digital Enhance Network (iDEN), HSPA+, WiNAX, LTE, Flash-OFDM, HIPERMAN, WiFi, IBurst, UMTS, W-CDMA, BSPDA+HSUPA, UNTS-TDD, other formats for utilizing cell or smart phone technology, telephony antenna distributions, and/or any combinations thereof] and includes the use of satellite, microwave technology, the internet, cell tower, telephony, and/or public switched telephone network lines.

Cell or art phones, computers, or other electronic apparatuses includes all cellular phones and mobile electronic communication devices (with cellular equipment, public switched telephone network lines, satellite, and/or mesh technology); personal digital assistants (PDAs); tablets (refers to all current and variants, revisions, and generations of the APPLE™, SAMSUNG™, HP™, ACER™, MICROSOFT™, NOOK™, GOOGLE™, SONY™, KINDLE™ and other tablets manufactured by these and other manufacturers); APPLE IPOD TOUCH™; smart or internet capable televisions; wireless timepieces or wireless watches; other electronic apparatuses with Wi-Fi and wireless capability; remote computers and controllers having internet, cellular technology, Wi-Fi, ZigBee, Bluetooth, Bluetooth low energy (BLE), and any combinations thereof.

LoRa, also known as LoRaWan (and referred to as "LoRa" herein) comprises a low-power wide area and long-range network protocol based on Semtech or HopeRF LoRa technology for IoT devices, and LoRa networks and machine-to-machine (M2M) applications. LoRa uses chirp spread spectrum (CSS) technology developed by the company Semtech. Chirp spread spectrum modulation, which is like Frequency Shifting Keying (FSK) modulation, but it increases the communication range significantly. Chirp spectrum uses its entire allocated bandwidth to broadcast a signal. Because the chirp spectrum utilize a broad band of the spectrum, chirp spread spectrum is also resistant to multi-path fading even when operating at very low power. Also, chirp spread spectrum is resistance to Doppler effect, which is typical in radio applications. LoRa focuses on secure bi-directional communications in an asynchronous protocol that is designed for long wireless range with extended battery life. LoRa manufacturers use the entire allocated bandwidth to broadcast a communication or signal, making the LoRa protocol robust to minimize channel noise and excellent at handling interference and overlapping networks. The LoRa protocol provides interoperability among smart devices without the need of complex local installations. LoRa network architecture is based on a star-of-stars topology with gateways as a transparent bridge relaying messages between end-devices and a central network server in the backend. Existing gateways are connected to the network server via standard internet protocol connections while end-devices use single-hop wireless communication to one or many gateways. All communication is generally bi-directional or duplex format, but also supports multicast operations for enabling software upgrades or mass distribution messages to reduce the on-air communication time. Communication between end-devices and gateways is spread out on different frequency channels and data rates. The selection of the data rate is a trade-off between communication range and message duration. Due to the spread spectrum technology, communications with different data rates do not interfere with each other and create a set of "virtual" channels increasing the capacity of the gateway. LoRa data rates range from 0.3 kbps to 50 kbps. To maximize both battery life of the end-devices and overall network capacity, the LoRa network server can manage the data rate and radio frequency output for each end-device individually by means of an adaptive data rate (ADR) scheme. The LoRa technology offers high penetration, low bandwidth, low energy, long range wide area, and secure data that is gaining significant traction penetration into the IoT networks.

The LoRa wireless system makes use of the unlicensed frequencies below 1 GHz that are available worldwide:

868 MHz for Europe
915 MHz for North America
433 MHz band for Asia

Using lower frequencies than those of the 2.4 or 5.8 GHz ISM bands enables much better coverage to be achieved especially when the nodes are within buildings enabling superior penetration of large buildings and penetrate solid walls.

Lora's main and upcoming competitor is Sigfox which employs the differential binary phase-shift keying (DBPSK) and the Gaussian frequency shift keying (GFSK) that enables communication using ISM radio bands 868 MHz in Europe and 902 MHz in the United States. Sigfox utilizes a wide-reaching signal that passes freely through solid objects and is considered to be a "Low-power Wide-area network" or LPWAN. The Sigfox signal can also be used to easily cover large areas and to reach underground objects. Presently Sigfox technology is being installed and utilized throughout the world as a wireless platform for IoT communications.

With traditional Wi-Fi, most networks were designed on the ranges delivered by 802.11 standard operating frequencies 2.4 and 5.8 GHz and protocol for distance and performance. Newer Wi-Fi technology being developed is known as WiFi3. In the foreseen near future, companies like Edgewater Wireless will develop and market Wi-Fi3 powered technology that will deliver reliable, high-capacity indoor and outdoor Wi-Fi wireless communication and protocols for high-density environments. The high channel density will enable multiple channels of a single chip meaning aggregate output on a single Wi-Fi3 enabled device will outperform traditional, single channel Wi-Fi technology.

Thus, the fewer access points will deliver higher quality of service that can considerably lower the cost of deployment of IoT devices. Remote and rural infrastructure installations are easily achievable due to the extended network coverage and performance capabilities of Wi-Fi3.

WiMAX refers to interoperable implementations of the IEEE 802.16 family of wireless-networks standards ratified by the WiMAX Forum. Wireless WiMAX suffers like most other wireless technology that the further away from the source the slower their connection becomes. The WiMAX Forum has proposed an architecture that defines how a WiMAX network can be connected with an IP based network. WiMAX Forum published three licensed spectrum profiles: 2.3 GHz, 2.5 GHz and 3.5 GHz, to establish standardization.

Ultra Narrow Band (UNB) refers to technology that transmits over a very narrow spectrum (for example less less than 1 KHz) to achieve ultra-long range for data communication between a sensor collection node transmitter or a communication between a sensor collection node transmitter and a communication receiving hub. By transmitting in a UNB channel, little power is required to transmit data over a considerable distance. UNB systems are frequently used in one-way, half duplex e.g. from collection node sensor(s) to an optional communication hub but can mimic two-way full duplex communication when the receiver/sensor is sleeping most of the time and must open once a few times each hour to listen for signal commands or messages.

The goal of the NB-IoT is another wireless technology designed to address the needs for very low data rate devices that need to connect to mobile networks, and often powered by battery power. Because NB-IoT is a cellular-based wireless technology that uses orthogonal frequency division multiplexing (OFDM) modulation, the chips are more complex to manufacture. Using typical cellular technology to obtain a high level of performance is penalized with an increase cost associated with involved tower installations and greater power consumption. NB-IoT is similar to Sigfox and LoRa but has a much faster modulation rate that can handle a lot more data than those Sigfox and LoRa technologies. However, NB-IoT is not an IP-based communication protocol A user can usually not communicate or access an IP network with NB-IoT or expect to use it with an APP running on a cell phone or smartphone. It was made for simple IoT applications and is more power efficiency.

6LoWPAN is an acronym that combines the new Internet Protocol (IPv6) with a sub 1 GHz frequency and low power wireless personal area networks. The 6LoWPAN supports hundreds of hops for developing wireless mesh networks with high self-healing (node failure) and self-maintenance of mesh routes. The 6LoWPAN architecture consists of a local network with routers/servers which utilizes a one or more edge router(s) to connect to the access network. The one or more edge router(s), communicating with the internal servers, then provides the IoT sensor and applications to access to the internet. IPv6 is also in use on the smart grid network enabling smart meters (water meter and leak detection systems) and other devices to build a micro mesh network before sending the data back to the main remote servers with database for monitoring and billing operations.

Bluetooth Low Energy (BLE) refers to a newer version of standard Bluetooth. Standard Bluetooth was originally designed for continuous streaming of data applications. Both standard Bluetooth and BLE low energy operate in the 2.4 GHz ISM band. However, the BLE remains in a sleep mode constantly except for when a connection is initiated. The actual connection times are on a few milliseconds, unlike standard Bluetooth's continuous streaming. BLE short time connection allows for higher data transfer rates of approximately 1 Mb/s.

Cellular (3GPP) refers to refers to a 3rd Generation. Partnership that formulated the original release 8 and the associated enhancements (9-14). The original LTE 4G release 8 included high peak data rates, up to 300 Mbps in downlink and 75 Mbps in uplink when using a 20 MHz bandwidth that includes high spectral efficiency and flexible bandwidths (1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz and 20 MHz), 5 millisecond latency for IP packets in ideal radio conditions, simplified Architecture, orthogonal frequency-division multiple access (OFDMA) in downlink and Single-carrier frequency-division multiple access scheme (SCFDMA) in uplink, all IP network, and using the multiple in and multiple out (MIMO) multiple antenna pattern.

The LTE Cat-M1 (also known as LTE-M} technology is designed for Internet of Things (IoT) devices. The LTE-M has different data speeds, frequency spectrum, power usage and signal range. LTE-M trades in data rate for better power efficiency and longer signal range and is therefore considered an "Internet of Things" (IoT) cellular technology. The 5G connects directly to a network, without the typical node/computer network that passes traffic from a local network to other networks or the Internet router (a gateway). Devices can connect to 5G networks with microchips that are less expensive to fabricate because these microchips are half-duplex and have a narrower bandwidth. Such designed devices can enter a "deep sleep" mode called Power Savings Mode (PSM) and only wake up periodically while connected. Because the maximum data rate of LTE-Cat-M1 (LTE-M) and 5G devices is only about 100 kbits/s, these cellular protocols do not burden the typical cellular network. Cellular 5G version uses a system of cell sites that divide their territory into various sectors and send encoded data through radio waves. Each cell site must be connected to a network backbone, whether through a wired or wireless connection. 5G networks will use a type of encoding called orthogonal frequency-division multiplexing (OFDM), which includes an interface that will be designed for much lower latency and greater flexibility than LTE-M. The 5G networks differ from 4G networks by managing significantly more, smaller cells that can dynamically change their size and shape so 5G networks need to be more intelligent than previous systems like 4G. But with existing macro cells, 5G is expected to boost capacity by over current 4G systems by utilizing wider bandwidths and advanced antenna technologies.

Wired communication can be standard wired technology, such as X10, UPB and the HART Communication Protocol (Highway Addressable Remote Transducer). X10 is a protocol for communication among electronic devices primarily used in the home automation industry. It primarily uses the power line wiring for signaling and control, where the signals involve brief radio frequency bursts representing digital information that transmits along the previously installed home electrical wiring. Universal Powerline Bus is a proprietary software protocol for power line communications between devices and again used for primarily in the home automation industry. Household electrical wiring is used to send digital data between UPB devices using pulse position modulation. The newer UPB protocol is more reliable that the older X10 technology, which allowed the UPB protocol to significantly penetrate the wired market. Communication can be peer to peer with no central controller necessary. The HART Communication Protocol (Highway Addressable Remote Transducer) is a hybrid analog+

digital industrial automation open protocol. Its most notable advantage is that it can communicate over legacy 4-20 mA analog instrumentation current loops, sharing the pair of wires used by the analog only systems. HART is widely used in process and instrumentation systems ranging from small automation applications through highly sophisticated industrial applications. Due to the huge installed base of 4-20 mA systems throughout the world, the HART Protocol is very popular for industrial protocols.

The terms wired (e.g. X10, UPB, HART Communication Protocol) and wireless electronic communication (e.g. Wi-Fi, Wi-Fi version 3 or WiFi3, 6LoWPAN, ZigBee, Z-wave, Bluetooth, Bluetooth low energy (BLE), WiMAX, long range low power technology such as LoRa, Ultra Narrow Band (UNB), and cellular technology 3GPP and LTE-M and 5G) correspond to the concept of "internet of things" or "IoT". The internet of things is defined herein as a network of physical objects or things that is comprised of electronic apparatuses (collect node and communication hub), programmable software, various sensor technology (flow, temperature and water quality and leak detectors), and local routers/servers and/or remote network and internet connectivity, which enable apparatuses to collect and exchange data. The internet of things allows devices to be sensed and controlled remotely across existing network infrastructure, creating opportunities for more direct integration between the physical world and computer-based systems and resulting in improved efficiency, monitoring accuracy and economic benefit. The internet of things encompasses technologies such as smart grids, smart homes, and intelligent wire and wireless electronic communications.

IoT Protocols refers to 1) MQ Telemetry Transport (MQTT) which is a machine-to-machine or "Internet of Things" connectivity protocol on top of TCP/IP. It allows extremely lightweight publish/subscribe messaging transport, 2) Extensible Messaging and Presence Protocol is a communication protocol for message-oriented middleware based on XML. It enables the near real-time exchange of structured yet extensible data between any two or more network entities, 3) Constrained Application Protocol (CoAP) is a specialized web transfer protocol for use with constrained nodes and constrained networks in the Internet of Things. The protocol is designed for machine-to-machine (M2M) applications such as smart energy and building automation, 4) Advanced Message Queuing Protocol (AMQP) is an open standard application layer protocol for message-oriented middleware. The defining features of AMQP are message orientation, queuing, routing, reliability and security. AMQP mandates the performance of the messaging provider and client to the extent that implementations from different vendors are interoperable, in the same way as SMTP, HTTP, FTP, etc. have created interoperable systems, 5) THREAD is an IPv6-based, low-power mesh networking technology for IoT products, intended to be secure and future-proof specification that is available at no cost, but requires agreement and continued adherence to an end user license agreement, 6) Zigbee is an IEEE 802.15.4-based specification with a group of high-level communication protocols used to create personal area networks with small, low-power digital radios, such as for home automation, medical device data collection, and other low-power low-bandwidth needs, designed for small scale projects which need wireless connection. Zigbee is a low-power, low data rate, and close proximity wireless ad hoc network, 7) Z-wave is a wireless communications protocol used primarily for home automation but applicable to IoT applications. It is a mesh network using low-energy radio waves to communicate from device to another device, allowing for wireless control, 8) Data Distribution Service (DDS) is an Object Management Group (ONG) machine-to-machine standard that aims to enable scalable, real-time, dependable, high-performance and interoperable data exchanges using a publish-subscribe pattern, 9) Hypertext Transfer Protocol (HTTP) is an application protocol for distributed, collaborative, hypermedia information systems, HTTP is the foundation of data communication for the World Wide Web, where hypertext documents include hyperlinks to other resources that the user can easily access and/or 10) a custom designed protocol.

Referring now to the drawings and particularly to FIG. **1**, shown is an illustrative view of the water meter and leak detection system **10** (**126** shown in FIGS. **6** and **200** shown in FIG. **7**) connected in series to the water supply lines in an appropriate location for local water monitoring **42** and for monitoring water use and leak detection within a private or public property(es) **40**. For accurate measurements of water use, the present invention can be installed in the standard water meter location or installed between the pressure reducing valve and the civil, commercial, governmental, or municipal supply water source(s) and before any distribution lines. It is also anticipated by the Applicant that the water meter and leak detection system **10** (**126** shown in FIGS. **6** and **200** shown in FIG. **7** can be used on wells and in situations where the water source is not obtained from civil, commercial, governmental, or municipal operations. The water use and leak detection apparatus **10** (**126** shown in FIGS. **6** and **200** shown in FIG. **7**) can have a sampling rate to upload or download water and energy use on various frequencies, e.g. once every 1-20 seconds (for monitoring the water event use), once per minute, once per hour, once per day, once per any frequency, or preferably can send information upon sensing the initiation of water flow until the water flow is stopped (defined herein as an "water event use" or "water event use basis") Monitoring on a water event basis allows for a quantitative analysis using software instructions, algorithms, and artificial intelligence to learn the daily, weekly or monthly water use patterns and frequencies of a specific private or public property(ies) to improve identification and evaluation of water use characteristics and Improved leak detection system. The water parameter information can be viewed on a custom display/recorder screen **50**, or cell or smart phones, computers, or similar apparatuses having an application program or APP (shown in FIGS. **10-13**).

The water parameter information can also be uploaded, either with the use of an optional communication hub or receiving station to an internet router using wired or wireless technology which transmits the data through remote servers (for example, Amazon Web Services, Oracle Cloud, Microsoft Azure Cloud) and associated database(s) or, alternately, through a private or commercial network with privately own servers.

Also shown in FIG. **1** is a wireless (or wired) communication means **52** from the water meter and leak detection system **10** (**126** shown in FIGS. **6** and **200** shown in FIG. **7**) for transmitting water use, water quality and leak detection information and/or data. The wireless (or wired) technology **52** can communicate with a conveniently located remote display **50** in a location for review by a private or public property owner, user, or responsible individual(s). Remote display **50** can be a custom apparatus or TV, computer, iPad, or another conveniently available display technology. All wireless (or wired) communications should preferably be a duplex format. Since the wireless communication means **52**

is in relatively proximity to the water meter and leak detection system **10** (**126** shown in FIGS. **6** and **200** shown in FIG. **7**), the wireless means can consist of Bluetooth or BLE, Z-wave, ZigBee, 6LoWPAN, or WiFi/WiFi3 or similar technology that can communicate with router technology. It is anticipated that WIMAX, LoRa, Ultra Narrow Band (UNB), 3GPP, and/or cellular LTE-M, NB-IoT and 5G technology might be necessary for longer distance communication using long range, low power, and/or high-density technology that can communicate with one or more communication hubs. The electronic communication comprises, in part, a segment of the internet of things (IoT) concept. The wireless (or wired) communication means **52** can also electronically communicate with a local router, which uses the internet and remote computer server(s) (Cloud technology) to provide remote access of the water data.

Also shown in FIG. **1** is another wireless communication means **54** from the water meter and leak detection system **10** (**126** shown in FIGS. **6** and **200** shown in FIG. **7**) for communicating water use and/or water quality information to a governmental, civil or municipal employee or individual **60** using a second custom remote display/recorder **56** for civil, commercial, governmental, or municipal operators/representatives. Since the wireless communication means **52** is not relatively close to the water meter and leak detection system **10** (**126** shown in FIGS. **6** and **200** shown in FIG. **7**), this wireless technology should consist of a longer-range technology such as LoRa, WIMAX, 6LoWPAN, UNB, Wi-Fi/Wi-Fi3 (with Wi-Fi extenders), Cellular 3GPP, NB-IoT, LTE-M and 5G. However, Bluetooth and BLE, ZigBee, Z-wave or similar wireless protocols are also possible as these technologies are improving in range and security measures and are offering better capabilities.

FIG. **1** shows another wireless communication **46** that is designed to communicate information or data utilizing cellular format technology with offsite central monitoring using cellular or other telephone lines including satellite or microwave technology, the internet, cell towers, telephone lines, or similar technologies. Such cellular format could be CDMA, GSM, 3GPP, LTE-M, NB-IoT and 5G or another cellular format. It is anticipated that the wireless communication **46** can transmit information to a remote database, which communicates with a registered cell or smart phone, computer, or similar apparatus for displaying use and leak detection data. The wireless communication **46** should include specific identification information e.g. the private or public property address. The wireless communication **46** can send data on various frequencies, e.g. once per minute, once per hour, once per day, once upon any frequency (e.g. every 1-15 seconds), or preferably upon a water event basis. The wireless communication can also send information upon sensing the observation of a leak condition, e.g. alarm situation, to the registered to the owner of a cell or smart phone, computer, or similar electronic apparatus. Alternately, continuous data monitoring can be stored in a data module in the water meter collection node and periodically transferred wirelessly to a remote computer or server as described herein. The water event basis monitoring can minimize the use of wireless signals within the private or public property(ies) or building (s), conserving energy, minimizing the interference with other wireless devices, and reduce the exposure of wireless energy to individuals.

Furthermore, the wireless communication **46** can consist of two-way transmission, commonly known as duplex transceiver technology, such that the water meter and leak detection system **10** (**126** shown in FIGS. **6** and **200** shown in FIG. **7**) can transmit and receive electronic signals with a remote station, cell or smart phone, computer, or similar apparatus. The wireless communication **46** can also comprise a radio frequency (RF) mesh-enabled or point-to-point device (meters, relays) technology that is connected to several other mesh-enabled or point-to-point devices, which function as signal repeaters, relaying the data to an access point. The access point device aggregates, encrypts, and eventually transmits the data back to a municipal or government agency over a secure third-party private or commercial network. The resulting RF mesh or point-to-point network can span large distances and reliably transmit data over rough or difficult terrain. If the water meter and leak detection system **10** (**126** shown in FIGS. **6** and **200** shown in FIG. **7**) or optional communication hub transmitter drops out of the network, its neighboring water meter and leak detection system **10** (**126** shown in FIGS. **6** and **200** shown in FIG. **7**) or optional communication hub will find another route. The mesh or point-to-point technology continually optimizes routing to ensure information is passed from its source to its destination as quickly and efficiently as possible. When the wireless communication **46** is being used, the water use data can be routed through a Bluetooth, Bluetooth low energy (BLE), Wi-Fi/WiFi3, ZigBee, Z-wave, LoRa, Sigfox, 6LoWPAN, WiMAX, Ultra Narrow Band (UNB), NB-IoT or other wireless technology using a local router/server or private or commercial network that transfers the water use data over the internet and remote servers (cloud technology). Signals and/or data can also be transferred by standard cellular format, 3GPP or LTE-M and 5G cellular technology (using a cell phone, smart phone, computer or similar electronic apparatus) from cellular towers to remote servers (cloud technology) and/or over the internet to a local router/server. The wireless communication **46** can be either half duplex and/or full duplex two-way transmission.

The wireless communications **52**, **54** and **46** are preferred to transmit, upload or download water parameter data or information via a secure wireless communication network. It is anticipated that the wireless communication **54** can be received by a moving vehicle or can communicate with cell phone towers **44** and cellular technology using wireless communication **46**. The electronic communication(s) comprises, in part, a segment of the internet of things (IoT) concept. The wireless communication **54** or wireless communication **46** can also electronically communicate with a local router/server which uses the internet to communicate with remote computers (cloud) to allow remote access of the water use data. Such remote cloud-based computers can be provided by a large commercial cloud computer company.

It is anticipated that the wireless communications **54** and **46** and the wireless or wired communication **52** utilizing wired technologies (X10, UPB etc.) can be used with the water meter and leak detection system **10** (**126** shown in FIGS. **6** and **200** shown in FIG. **7**) in any combination, thereof. For example, the present invention's collection node can use Bluetooth, Bluetooth Low Energy (BLE), Ultra Narrow Band (UNB), NB-IoT, Wi-Fi, Wi-Fi3, WiMAX, 6LoWPAN, Zigbee and/or Z-wave to communicate with a custom display device **18**, **56**, **110** or with a cell or smart phone, computer, or similar apparatus **400**. The collection node can also communicate with a local wireless router or through a private or corporate network system to a private, commercial, or government remote computer(s) or server(s). The collection node can also be connected by wired technology directly or through X10, UPB or HART Communication Protocol to communicate with a device such as a smart speaker hub or router. The collection node can also

connect to a private or commercial network system or to a router that communicates with the internet, all linked to a private, commercial, or government remote computer(s) or server(s). The collection node can also have a standard, 3GPP or LTE-M and 5G cellular technology to communicate wirelessly to the private, commercial, or government remote computer(s) or server(s). Also, one or more collection nodes can wirelessly communication using Lora, UNB, NB-IoT, 6LoWPAN, or WiMAX technology to one or more communication hubs (with point-to-point or meshing technology) whereby the communication hub or receiving station is either hard wired or uses Wi-Fi to communicate with a wireless router (or cable modem) to communication over the internet to a private or commercial remote server. These are just a few examples of combinations using various wired and wireless technologies with the present water meter and leak detection system.

Wireless communication means **46**, **52** and **54** preferably utilize encryption, authentication, integrity and/or nonrepudiation techniques to provide a secure transfer of the water information from the water meter and leak detection system **10** (**126** shown in FIGS. **6** and **200** shown in FIG. **7**) to the first custom display/recorder apparatus **50**, to the second custom display/recorder apparatus **56** and/or to the cell or smart phone, computer, or similar apparatus **400**. Also, wireless communication means **46**, **52** and **54** should include specific identification information e.g. property address, IP address. The wireless communication means **46**, **52** and **54** can send data on various frequencies, e.g. once per minute, once per hour, once per day, or preferably will send information on a water flow event basis to a first remote **50**, a second remote **54** or a remote computer/database which will allow access to registered owners of cell phone, smart phone, computer or similar electronic apparatus **400**. Furthermore, wireless communication means **46**, **52** or **54** can send data or information upon the sending of a request command. The request command can be generated by, for example, the pushing of a requesting button located on the first **50** remote, the second **56** remote or the cell phone, computer, smart phone or similar electronic apparatus **400** that transmits a request for water use and water quality use information or data to the water meter and leak detection system **10** (**126** shown in FIGS. **6** and **200** shown in FIG. **7**). The use of the request command can minimize the use of wireless signals within the private or public property{ies) building, conserving energy, minimizing the interference with other wireless devices and reduce the exposure of wireless energy to individuals.

Furthermore, the wireless means can consist of two-way transmission, commonly known as duplex transceiver technology, such that the water meter and leak detection system **10** (**126** shown in FIGS. **6** and **200** shown in FIG. **7**) can transmit water parameter data from the first, second remotes, **50**, **56** or cell phone, smart phone, computer or similar electronic apparatus **400** and similarly, the first and second optional remotes **50**, **56** and cell phone, smart phone, computer or similar electronic apparatus **400** can transmit electronic commands to the water meter and leak detection system **10** (**126** shown in FIGS. **6** and **200** shown in FIG. **7**) to e.g. regulate a water control valve.

The water meter and leak detection system **10** (**126** shown in FIGS. **6** and **200** shown in FIG. **7**) should be able to reliably and securely communicate the information collected to a remote central computer location. Difficult environments and distant locations for water meter installation can present wireless communication challenges. Solutions include using cell technology networks, satellites, licensed RF technology, unlicensed RF technology, and/or wired power lines. Additional remedies include fixed wireless, mesh, or point-to-point (and hybrid) networks or any combinations thereof. There are several other potential network configurations possible, including the use of Wi-Fi and other internet related networks. To date, no one solution seems to be optimal for all applications. Rural municipalities such as mountainous regions or areas ill-served by wireless and internet companies have very different wireless communication issues than urban or established area utilities.

TCP/IP technology has become a common communication and management platform for sensor to device applications, so software developers can utilize multiple communication systems while using TCP/IP technology. TCP/IP is a combination of two technologies where TCP comprise the fourth layer, and IP comprises the third layer, of the network and transport sections of the Open Systems Interconnect model (OSI model). Wireless technology such as LoRa, WIMAX, 6LoWPAN, UNB, Wi-Fi/Wi-Fi3 (with WiFi extenders), Cellular 3GPP, and/or LTE-M, NB-IoT and 5G, Bluetooth and BLE, ZigBee, Z-wave or similar wireless protocols or other communication technologies using the TCP/IP technology to transfer or download water data from a private or public property(ies) or used to upload data, information or software updates to the water mater and leak detection system **10** (**126** shown in FIGS. **6** and **200** shown in FIG. **7**).

Calibration of the sensors with the water meter and leak detection system **10** (**126** shown in FIGS. **6** and **200** shown in FIG. **7**) can be initiated by pressing hard button **114**, **116**, and **118** and/or soft button activators **140**, **144**, and **146** on the water meter and leak detection system **10** (**126** shown in FIGS. **6** and **200** shown in FIG. **7**) or by the custom display and/or a recording apparatus **50**, and/or by cell or smart phones, computers, or similar apparatuses **400** can be located remotely from the Water meter and leak detection system **10** (**126** shown in FIGS. **6** and **200** shown in FIG. **7**).

In another embodiment, the multiple independent flow sensors **105** can be engaged to the main water supply, irrigation system, or water use devices such as washing machine, water heater, dishwasher, kitchen faucets, bathroom faucets, shower, and/or toilets, and any combinations thereof. Each independent flow sensor **105** sends a unique code to the CPU, microprocessor or microcontroller **84** for identification associated with the water use device. Each independent flow sensor **105** can communicate the water usage by wired or wireless communicating with a unique code to the water meter and leak detection system **10** (**126** shown in FIGS. **6** and **200** shown in FIGS. **7** and **15**). The water data can be transferred to a remote device(s), e.g. remote display and/or a recording apparatus **50**, **110** and/or cell or smart phones, computers, or similar apparatuses **400**.

In another embodiment, which does not utilize an independent flow sensor at each water use device but rather a single flow sensor, can allow an owner/user to enter into a programmed "Device Calibration Mode" by pressing a specific hard or soft button (**126** shown in FIGS. **6** and **200** shown in FIG. **7**) or touch screen display **80**, or by sending an electronic command from a display and/or recording apparatus **50**, **110** and/or another remote device such as a cell or smart phone, computer, or similar electrical apparatus **400**. The water flow sensor **105**, optional pressure sensor **65**, optional acoustic sensor (with sophisticated software), and/or optional temperature sensor **93** can be combined within the water meter collection node (base station) that can monitor specific flow rates, flow durations, and total water use volumes, while the optional pressure sensor **65** can

monitor unique pressure patterns, and the optional acoustic sensor can monitor unique sound patterns. Thus, a single set of localized sensors (flow rate sensor **105**, optional pressure sensor **65**, optional acoustic sensor, and/or optional temperature sensor **93**) can be utilized and incorporated into the water meter and leak detection system **10** (**126** shown in FIGS. **6** and **200** shown in FIG. **7**). The optional pressure sensor(s) **65** and optional acoustic sensor(s) assist in identifying the specific water valve(s) for each water use device. During Device Calibration Mode, the user turns on or cycles one water use device, fixture or appliance (e.g. washing machine, dishwasher, shower) for a time period and the water meter and leak detection system's monitors the water flow rate, water duration, and total, water volume and, if applicable, utilizes optional, temperature sensors, optional pressure sensors and optional acoustic sensors to observe patterns water valves (movement and noise) to identify water valves for specific water use devices. The user continues this process for each water use device, fixture or appliance (e.g. main water supply, irrigation system, washing machine, shower, water heater, dishwasher, kitchen faucet, bathroom faucets, the toilets) until water use device(s) water use signature or pattern are calibrated and/or the specific water valve(s) is identified. The software uses data from the flow sensor for each water use device and record its water use signature (actual independent flow rates, variation of flow rate over time, water use duration, total volume used). To facilitate the "Device Calibration" a factory specification software signatures and patterns can be incorporated which approximate irrigation, washing machine, shower, water heaters, dishwashers, kitchen and bathroom faucets and toilets each independent water uses, that can be modified by the AI and software algorithms to be calibrated at the private and/or public property(ies) The optional pressure sensor(s) and optional acoustic sensor(s) observe movement, vibration, and noise patterns (sound and pressure patterns) to identify water valves for specific water use devices. The water, use data can be communicated to a display and/or a recording apparatus **50**, **100** and/or cell or smart phone, computer, or similar electronic apparatus **400** and the flow rates and water use for each water use device can be displayed appropriately.

It is anticipated by the Applicant that an "Automatic Sensor Learning Mode", where the software learns about the users water use at a private or public property (ies), can be completed without the calibration steps. The Automatic Learning Mode utilizes artificial intelligence (AI), software algorithms and other software to perform this operation. In this embodiment, a single sensor (e.g. flow rate sensor) **150**, with optional pressure sensor(s) **65**, optional acoustic se or(s), and/or temperature sensor(s) **93** can be located within or near the water meter and leak detection system **10** (**126** shown in FIG. **6** and **200** shown in FIG. **7**). Since independent water valves have unique pressures and sounds patterns when being closed or opened, the optional pressure sensor **65** and optional acoustic sensor can be incorporated into the water meter and leak detection system **10**, **126** and function to assist in identifying the water valve(s) of a specific water use device(s). To facilitate the "Automatic Learning Mode" a factory specification software water uses signatures and patterns which approximate irrigation, washing machine, shower, water heaters, dishwashers, kitchen and bathroom faucets and toilets each independent water uses, that can be modified by the AI and software algorithms at the private and/or public property (ies). A user can enter into a programmed "Automatic Learning Mode" by pressing a specific hard or soft button on the water meter and leak detection system **10** (**126** shown in FIGS. **6** and **200** shown in FIG. **7**) or touch screen display **80** or by sending an electronic command from a display and/or recording apparatus **50**, **110** and/or another remote device such as a cell or smart phone, computer, or similar apparatus **400**. In this Automatic Learning Mode, the water meter with leak detection system automatically tracks water use parameters over the period until enough information is observed. Such operation initiates the software to monitor the water use that occurs during the next days, weeks and/or months and, during this period, the learning AI software enters an aggressive learning phase. With the Automatic Learning Mode, the water meter and leak detection system **10** (**126** shown in FIGS. **6** and **200** shown in FIG. **7**) monitors water use, optional water pressure sensor, and temperature sensor to get water signatures or patterns from water use devices. Using the water flow rate sensor, the water flow rate, variation of flow rates over time, total volume, and duration of flow parameters can be used for signatures or patterns. The optional pressure sensor, temperature sensor and acoustic sensor can supplement the water meter and leak detection system **10** (**126** shown in FIGS. **6** and **200** shown in FIGS. **7** and **15**) signature or patterns to further characterize water use devices. The software can also track water use temporal patterns during a day or week period to further enhance the signature and pattern a public or private building or structure. For example, in a private residence, many showers might occur during the early morning hours as individuals are getting ready for work or school. During weekends, the showers occurrence might shift to a later period, and washing machine and, dishwasher water cycles might occur. The optional pressure and acoustic sensor(s) observe movement, vibration, and noise patterns (sound and pressure patterns) to identify water valves for specific water use devices. The Artificial Intelligent (AI) and software algorithms are used to process water use data (water signature and patterns) from the main water supply, irrigation system, and water use devices (e.g. washing machine, water heater, showers, dishwasher, kitchen and bathroom faucets). The AI software determines water use parameters, temporal characterization, property occupation and optionally monitor specific sounds and pressure patterns associated with water use (and non-water use) remembers water usage with consideration of time and day/week/month. The water meter and leak detection system transfers water data to a remote computer(s) or server(s) with database(s). Subsequently, the water data can be downloaded to a designated remote computer and database for registered cell or smart phone, computer or similar electronic apparatus to gain access.

For example, after a period of time (historical analysis), Automatic Sensor Leaning Mode using AI, software algorithms and other software can monitor a washing machine's range of water flow used and records the water use duration periods, water flow rate patterns (water flow rates for washing machine cycles and variations of water flow rates over time). The Automatic Sensor Learning Mode can use optional pressure sensor(s) for determining variations in pressure patterns and can use optional acoustic sensor(s) for identifying water valve movement and sounds when opening and closing and any vibrations during fully open valve with water flowing through the valve. In another example, when a toilet is flushed, the Automatic Sensor Leaning Mode software recognizes the toilet water use pattern. If a bathroom faucet is turned on for hand washing, the software can identify the combination pattern of the toilet filling and the faucet water use. In this case an optional acoustic sensor can identify and differentiate the toilet and bathroom faucet

water valves to more accurately monitor the water used by these different waters use devices at the public or private property or structure. The Automatic Sensor Leaning Mode software can analyze, record, and store actual independent flow rates, variation of flow rate over time, duration periods, temporal activities, optionally variations in pressure patterns (e.g. rate of flow at onset of water flow and rate of flow when turned off, and any variations during water flow duration, and optional acoustic sensor observing water valve characteristics to assign the signature or pattern of water use for the toilet and bathroom faucet.

The water meter and leak detection system's water leak detection and monitoring capability can use wireless technology such as LoRa, WIMAX, 6LoWPAN, UNB, Wi-Fi/Wi-Fi3 (with WiFi extenders), Cellular 3GPP, and/or LTE-M and 5G, Bluetooth and BLE, ZigBee, Z-wave or similar wireless protocols or other communication technologies using the TCP/IP or other OSI technology to transmit an alarm or message to notify of leak condition(s) at a private or public property(ies). Leak notification can be provided via call to a registered or designated cell or smart phone, computer, or similar apparatus or the water meter and leak detection system can send an alarm(s) or message(s) to a governing utility or municipality.

Analog sensors with analog data can be amplified by a circuit and connected to the CPU, microprocessor and/or microcontroller **84** through the use of an analog-to-digital module(s). Digital sensors can communicate with the CPU, microprocessor and/or microcontroller **84** directly.

The remote display devices **46**, **52**, **54** and **400** can communicate wirelessly are located remotely from the water sensor(s), CPU, microprocessor and/or microcontroller **84**, electrical circuitry, and data transfer technology **83**. The water meter and leak detection system **10**, **126**, **200** uses various wireless technologies. Examples include Bluetooth modules (using the 2.4 GHz band as Wi-Fi) such as the RN-41 Bluetooth modules available from Roving Networks in Los Gatos, Calif.; the KC-41, KC 11.4, KC-5100, KC-216 or KC-225 data serial modules from KC Wireless in Tempe Ariz.; and the BT-21 module from Amp'ed RF wireless solutions in San Jose, Calif. Wi-Fi examples include the Photon manufactured by Particle, Inc. and numerous other Wi-Fi products. Cellular technology examples include the Electron manufactured by Particle, Inc. numerous other cellular products. Wireless protocols that can be utilized with the water meter and leak detection system include, but are not limited to IEEE 802.11a, IEEE 802.11b, IEEE 802.11g and IEEE 802.11n modulation techniques. An example of the North America 915 MHz frequency is the wireless long range and low power technology known as "LoRa", which is marketed by many manufactures such as HopeRF (RFM95 W-915S2) and Semetech (SX1276). LoRa can be used with the collection node and the communication hub of the water meter and leak detection system **10**, **126**, **200**. LoRa is a low power wide area network specification intended for wireless battery operation. LoRa includes key requirements of Internet of Things (IoT) such as secure bi-directional communication, mobility, and localization services. Texas Instruments manufactures a competing technology known as the sub-1 GHz with 15.4-star networks (CC1125 or CC1310 device). NB-IoT chipsets and being developed by manufactures such as Snapdragon and Intel, just name a few. Other wireless protocols that can be utilized with the water meter and leak detection system are ZigBee, Z-Wave and IEE 802.15.4 modulation technology. Examples of cellular technology and protocols include CDMA and GSM and numerous other cellular protocols. The Applicant recognizes there are numerous wireless protocols and technologies that have been developed and, although not specifically listed herein, could be utilized with the present invention for data transfer purposes.

To increase wireless range and provide compatibility with wireless routers or corporate networks, the water meter and leak detection system **10** (**126** shown in FIGS. **6** and **200** shown in FIG. **7**) can be divided into two main components: 1) "collection node water meter" or "collection node", which comprises a water meter with electrical circuitry with power source, CPU/microprocessor/microcontroller, sensor(s) (water flow sensor(s), optional temperature sensor(s), optional pressure sensor(s), and/or optional acoustic sensor(s)) and 2) the receiving station or "communication hub", includes electrical circuitry, CPU/microprocessor/microcontroller, and one or more RF radios that communicate with the collection node water meter and one or more RF radios or cellular technology that communicate with a public or private network. Alternatively, the communication hub or receiving station can be hardwired or use wireless communication with an internet router.

The water meter collection node's electric circuitry includes a generally low power long-range wireless radio and the water meter collection node's power source can be AC or DC voltage, battery, and/or super capacitors. The battery and/or super capacitors can be supplemented with a water turbine electric generator. The water meter collection node communicates wirelessly with the communication hub which can extend the range of wireless technology. The communication hub has a CPU/microprocessor, electrical circuitry with a generally a first long-range wireless radio and a second Wi-Fi radio, and a power source (battery or AC or DC voltage). In one embodiment, the communication hub has a first wireless long-range LoRa, Sigfox, UNB, NB-IoT, 6LoWPAN, or WiMAX radio **103** that communicates with the water meter collection node (that has a corresponding LoRa, Sigfox, UNB, NB-IoT, 6LoWPAN or WiMAX radio). The communication hub, which has programmed instructions for processing the water flow data from the first long-range radio into a second wireless radio that communicates with a wireless router, or RF technology) and cellular radio that communicates with a private or public corporate network. The communication hub can alternately be hard wired to the router and then the Wi-Fi radio is not a necessary component of the electrical circuitry. The water meter collection node can communicate with one or more water meters collection nodes and/or with one or more communication hubs (using mesh technology and/or point-to-point technology). The communication hub can wireless communicate with one or more water meter collection nodes and/or with one or more communication hubs (using mesh technology and/or point-to-point technology).

The wireless or wire data transfer can be connected to the Internet using the IP or DHCP protocols whereby the water parameter data can be monitored remotely over the Internet using a software program(s) designed to record, display, analyze and/or audit the data. Data access would likely require server log on to perform query and obtain response.

Some wireless routers support a form of point-to-point or bridging operation which could be used to transfer water parameter data from the water meter collection node to a communication hub. Other proprietary protocols can be used with the Water meter and leak detection system **10** (**126** shown in FIGS. **6** and **200** shown in FIGS. **7** and **15**), for example, ISM (industrial, scientific and medical) bands. ISM bands are defined by the ITU-R in 5.138, 5.150, and 5.280 of the Radio Regulations. Countries' individual use of

ISM bands may differ due to variations in national radio regulations. In the United States, ISM bands use is governed by Part 18 of the FCC rules, while Part 15 Subpart B contains the rules for unlicensed communication devices including those that use the ISM frequencies. Part 18 rules prohibit using ISM for certain communications. The ISM bands defined by the ITU-R are:

| Frequency range [Hz] | Center frequency [Hz] |
|---|---|
| 6.765-6.795 MHz | 6.780 MHz |
| 13.553-13.567 MHz | 13.560 MHz |
| 26.957-27.283 MHz | 27.120 MHz |
| 40.66-40.70 MHz | 40.68 MHz |
| 433.05-434.79 MHz | 433.92 MHz |
| 902-928 MHz | 915 MHz |
| 2,400-2,500 GHz | 2,450 GHz |
| 5.725-5.875 GHz | 5.800 GHz |
| 24-24.25 GHz | 24.125 GHz |
| 61-61.5 GHz | 61.25 GHz |
| 122-123 GHz | 122.5 GHz |
| 244-246 GHz | 245 GHz |

While currently the 430 MHz and 900M1 Hz frequencies are commonly used in the United States, it is anticipated by the Applicants that other frequencies could be used for water use and water quality information or data communication transfers.

Cell phones receive and transmit electromagnetic waves that exist between 800 and 2400 megahertz and the most popular protocols are CDMA and W-CDMA, GSM, 3GPP, LTE-M and 5G, EDGE, HSPA and other generations.

Many newer internet protocols have been developed commonly known as an application programming interface (API). An A.PI for website usage is a code that allows two software programs to efficiently communicate with each other. The API defines a well organized and resourceful way for a programmer or developer to write software instructions in the program separate from an operating system or other application. One such API is the RestAPI system which aims for fast performance, standardization, reliability, and with the ability to grow, by re-using components that can be managed and updated without affecting the commercial system. A RestAPI uses HTTP requests to GET, PUT, POST and/or DELETE data or send control signals. A RestAPI, also referred to as a RESTful web service, is based on the representational state transfer (REST) technology, an architectural style and approach that has communications often used in web service development and communications between mobile device APPs and computer servers. REST technology is generally preferred API protocol because it utilizes less bandwidth, making it more suitable for internet and IoT usage. With cloud-company services on the rise, APIs are being developed to facilitate communication with web services mobile APPs. REST is a logical choice for building APIs that allow users to connect and interact with Cloud services.

RestAPI has a uniform interface, which serves as the interface between water meter data generated and transferred to remote computers, cell phones and computers with mobile APPs or stations with computer programs and remotely located computer servers. The uniform interface simplifies and decouples the REST architecture, which enables the device APPs or station computer programs and remotely located computer servers to evolve independently. The main guiding principles of the uniform interface are described below.

First by using resources for identified using Uniform Resource Identifiers (URIs) as resource identifiers. The identifiers are separated from the representations that are returned to the client. The commercial or private server does not transfer data directly from the database, but rather, utilizes HTML, XML or JSON code that is designed to represent database records expressed in variable width character encoding, depending on the details of the structured query language (SQL) request and the server implementation.

Second, a representation of a resource, including any metadata attached, and the software will verify that it has enough security information to modify or delete the resource on the server only under proper server permissions.

Then, a third process includes that each message includes enough information to describe how to process the message invoking specified content by an Internet media type. Responses also explicitly indicate their cache-ability.

On the fourth process the delivery of data or information utilizes SQL or non-SQL parameters, body content or headers, and requested URI for transmission communications. Computer or servers respond via body content, response codes, and response headers to the request. Hypermedia as the Engine of Application State (HATEOAS) links are contained in the returned body (or headers) to supply the URI for retrieval of the database objects from a remote computer server(s) with database(s).

Stateless of the REST architectural style and associated RestAPI protocol handles any sent requests, whether as part of the URI, query-string SQL or non-SQL parameters, body content, or headers. The URI uniquely identifies the resource and the body content contains the state (or state change) of the resource. After server/computer processes the request, the appropriate state (or the piece(s) of state that matter) is communicated back to the requesting mobile APP or computer program via headers, status, and response body.

The RestAPI protocol includes a properly managed caching that facilitates client-server transfers o water meter data, and communication with cell phone APPs, station programs and remotely located server interactions, further improving scalability and performance. Since remote computers and servers are not directly concerned with the water meter, computer and servers can be scalable. Computers and servers may be replaced, process operating system or software updates, and/or developed independently and whereby the RestAPI interface is maintained and unaltered.

The LoRa open specification create a low power, wide area LoRa technology network that is designed to wirelessly connect battery operated devices and sensors to the internet. The LoRa protocol utilizes the unlicensed radio spectrum in the Industrial, Scientific and Medical (ISM) band. The specification defined the device/sensor to infrastructure of the LoRa physical layer (OSI) and provides seamless interoperability between devices, sensors APPs and computers.

Once a user sets up a service, an activation or pairing application delivers a first display to the user on either a display means of the cell or smart phone, computer or similar apparatus **400**, smart internet TVs, smart central hub listening and speaker devices, and home control systems, on the water meter and leak detection system **10** {**126** shown in FIG. **6** and **200** shown in FIG. **7**) and/or on a display means on the remote devices **480**. Pairing technology or other application secure means associates a new user with a purchased or installed remote device and the water meter and leak detection system **10** (**126** shown in FIGS. **6** and **200** shown in FIGS. **7** and **15**). For example, when the new user

activates the APP the first screen will request the SSID and password of the local LAN or wireless router and then records this for subsequent access or alternately, scan a QR code with the cell phone camera. A computer program or web portal can use the internet to allow access for new user's water use and leak detection data by inputting a username or SSID and password or using a two-step authentication scheme (email, phone call or code authenticator).

The water meter and leak detection system **10** (**126** shown in FIGS. **6** and **200** shown in FIG. **7**) will require the transfer of water use and water quality data or leak detection information using security measures due to violation of municipal or governmental laws and ordinances, and for obstructing fraudulent activities.

There are several important security techniques that taken as a whole, or in part, function to meet the objectives to, including authentication, integrity, encryption and non-repudiation that provide secure communications.

Several current security techniques that utilize public key cryptography are the Public Key Infrastructure (PKI), the Public Key Encryption (PKE) and the Digital Signature protocols. PKI enables digital certificates to be used to electronically identify an individual or an organization. A PKI requires a certificate authority (CA) that issues and verifies digital certificates and can utilize a registration authority (RA) that acts as the verifier of the CA when a new digital certificate is issued. PKE is a message or command signal that is encrypted with a recipient's public key. The message cannot be decrypted by any individual or machine that does not possess the matching private key. PKE is a security protocol that is used to maintain confidentiality. Similarly, Digital signatures are also utilized with key pair technology, in association with authentication, integrity and non-repudiation confidentiality techniques. In practice, when a user transmits a message or signal or data with a digital signature, the message or signal includes a one-way hash prior to transmission, and the recipient uses the sender's public key to decrypt the hash and verify the digital signature. PKI, PKE, and digital signers are currently being supplemented with two factor authentication that utilizes a confirmation protocol after password input with a follow up email, phone call, or utilizing a authenticator number scheme. Furthermore the PKI, PKE and digital signature techniques might become archaic when block chain technology becomes more generally adopted.

Various encryption algorithms such as include the original RSA algorithm, Advanced Encryption Standard (AES), Data Encryption Standard (DES) and Triple DES.

Secure technologies include the Secure Sockets Layer ("SSL") which creates a secure connection between two communicating programs or applications. SSL is a standard security technology for establishing an encrypted link between a server and a client-typically a web server and a mail server or a mail client (e.g., Gmail). The SSL protocol are commonly utilized by web browsers and web servers in conjunction with HTTP protocol to perform cryptographically secure web transactions.

Another security technology is the Internet Protocol Security ("IPSec") which protects internet protocol traffic across the Internet and is particularly useful for implementing VPNs that utilized tunnel and encryption techniques. IPSec originally utilized an IP authentication header. IP encapsulating security payload was an optional packed header that can provide superior confidentiality through encryption of the packet. Point-to-Point Tunneling Protocol ("PPTP") is another secure protocol that allows entities to extend their local network through private "tunnels" over the Internet. Layer Two Tunneling Protocol ("L2TP") is an extension of the PPTP protocol.

A Media Access Control Address ("MAC Address") is a unique number assigned to a network interface controller for communications with the data link layer of the Open Systems Interconnection Model (OSI Model.) The MAC address is appended to a digital message and provides authentication and integrity for the message.

A further security protocol, the extensible Markup Language (XML) Signature associates a cryptographic signature value with Web resources using XML markup. XML signature also provides for the signing of XML data. Javascript object notation (JSON} has become more popular alternative to XML for various reasons, for example, JSON is less verbose than XML which uses more words than necessary and JSON is faster processing whereas XML software is generally slow and cumbersome.

The water meter and leak detection system **10** (**126** shown in FIGS. **6** and **200** shown in FIG. **7**) should communicate securely with remote displays/recorders **52**, **54** or cell phone, smart phone, or similar apparatus **400** and therefore they need to be provided with unique identities. The identity must not be easy to detect either intentionally or accidentally.

Residential and corporate location identity are particularly relevant in multi-site scenarios, where the water meter and leak detection system **10** (**126** shown in FIGS. **6** and **200** shown in FIG. **7**) are aggregated across a wide geographic area containing multiple sites, serviced by multiple utilities, each site operating on one or more municipal agencies. Each water meter and leak detection system **10** (**126** shown in FIGS. **6** and **200** shown in FIG. **7**) will need to identify itself when transmitting water use or water quality data or information, or queried by a civil, commercial, municipal or governmental operator or agency.

Each the water meter and leak detection system **10** (**126** shown in FIGS. **6** and **200** shown in FIG. **7**) will have its own identification means that will be recorded in a remote database. The identification can be the Media Access Control (MAC) address (OSI data layer), internet TCP/IP address (OSI transport and network layers), private or public property(ies) building address or users email address or incorporate a distinctive set of numbers or characters associated with a particular municipality or governmental agency.

It essential that water meter and leak detection systems **10** (**126** shown in FIGS. **6** and **200** shown in FIGS. **7** and **15**) will have the same identity within a specific geographical area. It might be also be preferred that the entity, municipality or authority name become a portion of the unique identification code. During the fabrication process, the unique identification code could include adding a unique municipality or authority name code in the water meter and leak system apparatus **10** (**126** shown in FIGS. **6** and **200** shown in FIGS. **7** and **15**) or software downloaded upon installation or inserted during a repair or maintenance periods.

It is essential that water meter and leak detection system **10** (**126** shown in FIGS. **6** and **200** shown in FIG. **7**) will have the same identity within a specific geographical area. It might be also be preferred that the entity, municipality or authority name become a portion of the unique identification code. During the fabrication process, the unique identification code could include adding a unique municipality or authority name code in the water meter and leak detection system **10** (**126** shown in FIGS. **6** and **200** shown in FIG. **7**)

or software downloaded upon installation or inserted during a repair or maintenance periods.

A unique identification code registry is maintained within a remote database that is associated with the installation and operation of water meter and leak detection system **10** (**126** shown in FIGS. **6** and **200** shown in FIG. **7**). The unique identification code registry may be updated whenever a water meter and leak detection system **10** (**126** shown in FIGS. **6** and **200** shown in FIGS. **7** and **15**) is brought into or removed from service. The unique identification code registry may be incorporated into the relevant remote database with a unique host name (municipality or governmental agency) or installation region encoded within unique identification code. This would result in several databases that are unique to a given municipality, governmental agency or geographic region. Alternatively, the unique identification registry can be implemented as a single large database. The registry can be implemented as a relational database (e.g. MySQL, MariaSQL), non-relational database (e.g. Amazon DynamoDB), XML files, Comma Separated Value (CSV) Excel files, or Resource Description Files (RDF), or any mechanism that allows associated verification when combined with the appropriate software analysis. The unique identification registry enforces distinctiveness, thereby preventing two water meter and leak detection system **10** (**126** shown in FIGS. **6** and **200** shown in FIG. **7**) from having the same unique identification code.

Encryption, authentication, integrity and non-repudiation may be important characteristics when the water meter and leak detection system **10** (**126** shown in FIGS. **6** and **200** shown in FIG. **7**) is transferring water use or water quality data or information to a remote server/database via a public or private network that provide wireless subsequent access to registered computers and cell, smart and mobile phones **400**. When the water mater and leak detection system **10** (**126** shown in FIGS. **6** and **200** shown in FIG. **7**) receives or uploads data and information such as a control command signal to send or transmit data and information it is critical that the device can authenticate the sender and be sure of the integrity of the data and information. Encryption provides privacy by converting the data or information into an "encrypted" code to prevent unauthorized access. Encryption can be provided point-to-point, or end-to-end, and transmit messages using encryption schemes such as Pretty Good Privacy (PGP), Secure/Multipurpose Internet Email (S/MIME), XML, or SSL encryption protocols. Non-repudiation prevents the sender from denying that they sent or received data/information or a message. Non-repudiation can be provided by signing, electronic witnessing and technologies that assert a document was read before it was signed. One of the main advantages of the Block Chain technology is that non-repudiation is nearly immutable. Here, the water meter and leak detection system **10** (**126** shown in FIGS. **6** and **200** shown in FIG. **7**) can include digital signature technology, data packets or messages using PGP, S/MIE, XML and Digital Signature, TLS/SSL and two-step authentication to provide for non-repudiation of those messages, information or data.

The water meter and leak detection system **10** (**126** shown in FIGS. **6** and **2** how n in FIG. **7**) will transfer data to remote computers or servers whereby a user can obtain water use data or water quality information on a predetermined programmed frequency. The preferred method of data transfer will be on a water flow event basis which monitors the initiation of water use, its initial water flow rate, intermediate water flow rates, and when the water ceases to flow (turned off) the water use duration and total water used is calculated. The frequency can be programmed for various time periods erg. e.g. once per minute, twice per hour, once per day, once per week, once per month or once per year or can be transfer to a remote computer/server and accessed by a cell phone, smart phones, mobile phone, computer or other mobile electronic communication device. Also, when the data or information can be processed by an automated system and reports are only created every day, or week, or month, there s some flexibility when the data must be sent. The water meter and leak detection system **10** (**126** shown in FIGS. **6** and **200** shown in FIG. **7**) can be programmed to communicate at other time frequencies, such as every 5 seconds or every minute, or preferably in a water flow event basis to identify leaking conditions. In this case, data transfer and signature calculations can be executed only when there is free processing time. This scheme performs well with the water meter and leak detection system **10** (**126** shown in FIGS. **6** and **200** shown in FIGS. **7** and **15**) where important water flow event basis provides real-time calculations that can take up significant available calculation time for small periods, but over time periods of a few hours, when water is not flowing, there is processing time to spare.

In an alternate embodiment, the encrypted data is transmitted optionally to a local router/server and then across the Internet or cell tower technology, or via directly to a public or private network as it has been described herein. This is accomplished directly by the water meter collection node or by using remote receiving stations or communication hub with Wi-Fi/Wi-Fi3 **101** or LoRa, WiNAX, Ultra Narrow Band (UNB), NB-IoT, 6LoWPAN, standard WiFi and (WiFi3 with Wi-Fi extenders) **103** duplex wireless or wired directly to the internet router that communicates to remote servers. In the LoRa or WiMAX (or Ultra Narrow Band (UNB), 6LoWPAN, standard WiFi and WiFi3 with Wi-Fi extenders) **103** wireless communication, the current marketed routers would have to be modified to receive the LoRa, WiMAX (UNB, 6LoWPAN) wireless duplex transmission. This has the advantage that water meter and leak detection system **10** (**126** shown in FIGS. **6** and **200** shown in FIG. **7**) does not need to store, but can, encrypted data.

The water meter and leak detection system **10** (**126** shown in FIGS. **6** and **200** shown in FIG. **7**) can include a removable or a non-removable storage device that can contain use and/or water quality data. This removable storage device may be removed when there is a disruption in wireless transmittal of data, to upgrade configuration programs, or to download stored data. The Water meter and leak detection system **10**, (**126** shown in FIGS. **6** and **200** shown in FIG. **7**) may be fitted with a physical lock that prevents unauthorized individuals from detaching the removable storage device.

Software may be designed to validate digital signatures before water use or water quality data or information can be downloaded or allow registered users to upload updated software and/or firmware. The water use data, updated software and/or firmware may incorporate its own code (e.g. RestAPI) to verify digital signatures to ensure that the original software and/or firmware has not been tampered with and is from an authorized source. The uploaded firmware or software can be written in various languages, to name a few, such as Java, JavaScript, NodeJS, Prolog, Haskell, binary executable code, C+ and C++, and ECMA Common Language Runtime ("ECMA CLR"). In additional, the Water meter and leak detection system **10** (**126** shown in FIGS. **6** and **200** shown in FIG. **7**) or the remote display means **18**, **50**, **56**, or computer, cell, smart or mobile phone **400** could include a microprocessor that has a data memory

bank with data memory that stores the water use data that can be compared with the data that has been transferred and uploaded by the government or municipal second remote display/recorded means **56**.

In addition, any stored data, including cached data and data stored in a database, is identified with a digital signature. When the data is retrieved, the digital signature can be used to verify that the data has not been tampered or changed.

Referring now to the drawings and particularly to FIG. **2** is a perspective view of the first embodiment comprising an optional primary or secondary water meter and leak detection system **10** (**126** shown in FIGS. **6** and **200** shown in FIG. **7**) attached to the cold and hot input water supply piping **14** and water supply piping.

The plurality of water pipe unions or joints **30**, **32**, **34** and **36** can be fabricated from typical metallic or polymeric materials. Male/Female thread consisting of NPT tapered threads, NPSM straight thread (with O-ring or washer sealing technology) or metric thread configuration or other attachment means, such as adhesive, snap fit joint, compression fitting, flare fitting or other technologies can be employed. The plurality of optional display means **12**, **14**, and **16** and as presented in FIG. **2** utilizes one or more illuminating technologies, such as LCD, LED, gas plasma, fluorescence, incandescent, halogen, halide, or other lighting technologies. FIG. **2** shows a hot-water and a cold/ambient water input and a hot water and cold/ambient water output for monitoring hot and cold water (water energy). But FIG. **2** also represents (but not shown) a single cold or ambient water input and a cold or ambient water output.

The optional display means **12**, **14**, and **16** can be programmed to display one or more water parameters in a visual means that can be either an analog, character or digital display, or combination of display formats. Information obtained from the appropriate sensors monitoring or measuring the water parameters such as temperature, date/time, and flow rate can be displayed in an appropriate format on the display means.

Also shown in FIG. **2**, one or more optional ergonomically **19**, **21**, and/or **23** placed buttons or activators can be incorporated into the display housing to allow the modification of certain parameter units (e.g. metric to US), set alarm conditions (e.g. flow/volume rate-set points), or to program certain settings, e.g. over water use alarm, monitor continuous leakage (valve not complete shut off). The buttons will electrically communicate with the electronic circuit board contained with the housing **18** and respond to programmed instructions integrated within the CPU or microprocessor **84** and associated circuitry of the electronic circuit board.

An optional visual alarm or command can be incorporated into the Water meter and leak detection system **10** (**126** shown in FIGS. **6** and **200** shown in FIG. **7**) whereby a preset alarm or programmed alarm, changes the one or more screen displays, for example, blinking a parameter, or changing the color of a parameter (green to red). For example, one or more displays can exhibit a first background or text color (e.g. green) when a first volume range of water use has been monitored. After a second volume range of water use has been monitored, the one or more displays can exhibit a second background or text color (e.g. yellow). And when a third volume range of water use has been monitored, the one or more displays can exhibit a third background or text color (e.g. red) when a third volume range of water use has been monitored.

The optional visual alarm or command might include visual reference on the water meter or on a cell phone, for example, an in-operative condition, broken sensor, low power source, no flow, reverse flow, and/or some default limits. Programmed visual alarms would allow for individual selection (e.g. volume over set point, flow rate set point, total volume exceeded set points) which might be restricted or not by the default settings.

In addition, an optional auditory alarm can be incorporated into the present invention whereby a preset alarm or programmed alarm, changes the screen display, for example, using sound or pulsing a specific noise, or changing the color of a parameter. For example, the temperature or pressure display can change from green to red when a preset temperature or pressure is beyond a specific or programmed limit. A preset alarm might include visual reference, for example, an in-operative condition, broken sensor, low power source, backward water flow, and some default limits. Programmed auditory alarms would allow for individual selection (e.g. water use over set point, time past set point, flow rate set points) which might be restricted or not by the default settings.

In addition, the water meter and leak detection system **10** (**126** shown in FIGS. **6** and **200** shown in FIG. **7**) can include water shut off means to turn off the water supply if an alarm condition or setting point is exceeded and has been activated. The water shut off means is electrically connected to the CPU or microprocessor and has an electrical power to move a ball valve position or energize a solenoid valve, such the computer controls the application of electrical power to activate or de-activate the water shut off means. The water shut off means can comprise, for example, a typical electronically controlled ball valve or solenoid shut off valve incorporated into, or in series with, the water meter collection node such that water from the source is closed. The electronically controlled ball or solenoid valve can also be incorporated into the water meter collection node as an integrated unit. The water shut off means can be activated if an alarm state has been achieved, e.g. 200 gals/day of water is exceeded the total of e.g. 50 continual gallons of water has flowed in an unusual duration or flow rate since the water source was opened. The alarm or settings can be a default setting installed by the manufacturer or programmed by the user. In addition, the water meter and leak detection system **10** (**126** shown in FIGS. **6** and **200** shown in FIG. **7**) can have capabilities such as vacation mode that turns off the water on a specific date and then turns the water on for the returning date. A scheduling mode can also be programmed that turns off the water when the home is unoccupied, e.g. when the family is at work from 8 a.m. to 5 p.m. In addition, the scheduling can be coupled with the vacation mode to allow the water to be turn on only for the date and times the irrigation is desired to be operational. The water control valve can have a variable open design whereby different opening of e.g. ball valve, electrical activation or de-activation can change the opening and resulting flow rates.

Now referring to FIG. **3**, shown is a is a timing clock integrated circuit **88** with data transfer means **89** for communicating with the CPU or microprocessor, or microcontroller **84** and having a power line **85** and ground line **86**. The timing circuit **88** can communicate with the CPU, microprocessor, or microcontroller **84** to an optional display **80** such information such as the time of day and current date and/or a time stamp for the duration that the water supply has turned been on and off. For monitoring the time stamp parameters of the water flowing through the present invention, the use of various trip switches or water sensors near

the flowing water can be monitored. The timing clock IC **88** will assists by communicating a signal to the CPU or microprocessor **84** that the water supply has been turn on and then shut off such that the software instructions and CPU or microprocessor can calculate various parameters, such as, but not limited to, the duration of water supply, total number of gallons or liters of water used and flow rates.

An optional temperature sensor **93** with a data transfer means **92** for communicating with the CPU, microprocessor and/or microcontroller **84** and having a power line **96** and ground **97**. Also shown is one or more flow sensors **105** (e.g. flow rate, pressure, ultrasonic, turbine, acoustic with a data transfer means **108** for communicating with the CPU, microprocessor and/or microcontroller **84** a power line **106** and ground line **107**. Any associated integrated circuits for the timing clock **88**, temperature sensor **93** and flow sensor **105** can include circuitry to convert analog data to a digital format. Also shown is a first wireless electronic communication radio or means **58** consisting of Bluetooth, Bluetooth low energy (BLE), Z-wave and Zigbee and other similar short-range wireless technology **102** with a data transfer **59**. A second wireless electronic communication radio or means **61** with a data transfer **62** consisting Wi-Fi and WiFi3 and other similar wireless technology where data transfer means **62** communicates with the CPU **84**. A third wireless electronic communication means **63** with a data transfer means **64** consisting LoRa, WiMAX, Ultra Narrow Band (UMB), NB-IoT, 6LoWPAN and other similar long-range wireless technology where data transfer **64** communicates with the CPU **84**. The third wireless communication can also include cellular technology (**46** as shown in FIG. **1**) that is designed to communicate data utilizing a cellular format (standard 2G, 3GPP or LTE-M and LG5 cellular) with connection to offsite central monitoring computer using cell towers and other telephone lines via satellite, microwave technology, and the internet. Such cellular format could be CDMA, GSM or another advanced cellular formats (3GPP/LTE-M, NB-IoT, and 5G). The water meter and leak detection system can use any combination of the wireless electronic communication **58**, **61**, **63**. Meters can have removable replacement modules that can be exchanged such that different types of wireless technology modules can be changed in the manufacturing factory or in the field to accommodate wireless needs in different environmental situations.

Also shown in FIG. **3** is an optional display **80** with a power line **81** and ground line **82**. The display can utilize LCD, LED, gas plasma, fluorescence, incandescent, halogen, halide, or other lighting technologies.

An optional water energy generator **95** with data transfer communication **99** for communicating with the CPU (microprocessor and/or microcontroller) **84** with a power line **78** to the main power supply **98**. The water energy generator **95** can be a turbine, paddle, Pelton type or other similar technology. Recharging batteries **87** or super capacitors **94** can be accessed from a water-resistant door of the collection node housing or with a water-resistant electrical coupler on the housing where the battery(ies) reside outside of the housing for periodic maintenance.

Also shown is an optional pressure transducer or sensor **65** with date transfer communication **67** and a power line **69** and ground line **68**. The optional pressure transducer or sensor **65** can be used to provide pressure waves and changes in pressure when water use devices are actuated. The optional pressure transducer or sensor **65** can also be used to monitor pressure loss over a time when the control valve is closed as a leak test.

In efforts to save energy due to wireless transmission and CPU operations, a wake-up button **104** can be included the function to initialize electrical energy after the system goes into a sleeping mode. The wake-up button has a date communication line **111** to the CPU (microprocessor and/or microcontroller). The wake-up procedure preferably is controlled by software that automatically initiates periodically monitoring for the initiation of water flow.

Main power **98** produces a power line **85** and a ground line **86**. The main power **98** is preferably one or more batteries **87** and/or on or more super capacitors **94** as the power source. With the one or more batteries or super capacitors, is would be preferable to have the water energy generator **95** to supplant energy when generated during periods that water flow occurs. An example of long-life batteries that can be used with the water meter and leak detection system **10** (**126** shown in FIGS. **6** and **200** shown in FIG. **7**) are the industrial lithium thionyl chloride ($Li-SOCl_2$)) bobbin-type or spiral wound batteries produced by companies such as Tadiran Battery company. Super capacitors store energy by means of a static charge caused by a voltage differential on position and negative plates. Super capacitors should have a high capacitance which is ideal for applications that require frequent charging and discharging at high current and a short duration. A super capacitor can also operate like a battery with the addition of special electrodes and electrolytes to increase its energy density. Higher voltage can be produced, but the trade-off is shorter service life. To obtain higher voltage, super capacitors must be connected in series. When two or more super capacitors are connected in series, protective circuitry is required to prevent any cell from going over-voltage. The self-discharge rate of a super capacitor can be much higher than a Li-ion battery, as certain super capacitors can discharge 50% to 100% of their available capacity in 30 to 40 days. A $LiSOCl_2$ bobbin type battery with a hybrid super capacitor would be an ideal primary cell power source that offers the highest capacity and highest energy density of any sole lithium cell, along with an extremely low annual self-discharge rate.

It is anticipated that solar panels (water meter box cover) or wind generator can be also used to supplant electrical energy. It is also anticipated that AC or DC (AC-DC adapter) can be used for electrical energy.

The CPU **84** that processes the information supplied by the flow sensor **105**, the optional temperature sensor **93**, the optional pressure sensor **65**, and timing circuit **88** uses internal instructions to control the information projected on a display, transferring water use data by wired or wireless communication, and for processing leak detection alarm states. The microprocessor can include an EEPROM or any type of memory section that allows for specific programming to be incorporated as processing instructions. Furthermore, the microprocessor may have the capability to convert analog signals into digital information for decoding and processing. The CPU can have Analog-to-Digital Inputs that can provide the means for converting the information obtained from the flow sensor **105**, the optional temperature sensor **93**, the optional pressure sensor **65** from its analog format into a digitized form for processing by the instruction sets of the CPU or microprocessor **84**. It is anticipated by the Applicant that more powerful microprocessors with more memory capacity may be utilized to accommodate the more complex operations. There are many other variants or other microprocessors, whether commercially marketed or privately fabricated, that can be used with the present invention.

In addition, a means to record and digitally story the water parameters or data can be incorporated into the present invention. An integrated memory circuit can be incorporated into the CPU or microprocessor **84**, or can be a separate memory circuit, and can include associated circuitry with a means to transfer the recorded data to a removable media, such as a flash mount on an electronic circuit board to control the display means and communicate with the sensors. Various data access ports, such as serial, parallel, or USP can be used to transfer the stored data to another device, such as a computer. The CPU or microprocessor **84** and associated circuitry mounted on the electronic circuit board can also have the capability to be programmed for controlling certain display means (e.g. U.S. or metric units), programming alarm or setting states (e.g. flash all display means red when the total volume has exceeded a certain volume, for example, 175 gallons/day).

Because the water meter and leak detection system (**126** shown in FIGS. **6** and **200** shown in FIG. **7**) can be used in situations where the source of water comes for a well or non-commercial operation, and furthermore, where the commercial operations water treatments plants are under pressure to provide more water supplies or where problems, breakdowns or accidental situations can cause contamination of the water source, the present invention can be fitted with, display parameters of, and provide warning for, numerous mineral, elements and biological contaminates.

Not shown but could be included with the water meter and leak detection system (**126** shown in FIGS. **6** and **200** shown in FIG. **7**) or added as a removeable and replacement modules as described herein, is the acoustic sensor technology and associated software that can be used to identify water valve movement.

As illustrated in FIG. **4** is a cross-section showing the one or more sensors **70**, **72**, **74**, **76**, **78**, **130**, **132**, **134**, and **136** located in close proximity to, or within a, water supply line and/or a water delivery supply line and their relative position of the sensors in the supply line lumen and the connecting wires **71**, **73**, **75**, **77**, **79**, **131**, **133**, **135** and **137** for the display means, data transfer etc. For exemplary purposes, sensor **72** could be a timing sensor e.g. to monitor when water is flowing, sensor **74** can be another temperature sensor, sensor **76** can be a pH sensor, **78** can be a halogen (e.g. chloride or fluoride) sensor, **130** can be a total dissolved solids sensor, **132** can be a biological or fecal sensor, and **134** can be a water hardness sensor and **136** can be a specific iron or other mineral sensor.

In general, a sensor is type of transducer that is generally paired with an indicator display. Most sensors are electrical or electronic, although other types exist (e.g. mechanical).

Technological progress allows for more and more to be manufactured on the microscopic scale as micro-sensors using MEMS technology. In most cases a micro-sensor reaches a significantly higher speed and sensitivity compared with macroscopic approaches.

There are many types of sensors that can be used with the present invention. Since a significant small change involves an exchange of energy, sensors can be classified according to the type of energy transfer that they detect. For measuring or monitoring the temperature of the water flowing through the water meter and leak detection system **10**, **126**, the use of various thermocouples or thermistor sensors **70** as depicted in FIG. **3** is protruding within the water supply lumen **38** (or in close proximity to the water to be measured) and mounted within the articulating joint mechanism **22**. Wires **71** are shown extending from the sensor **70** to electronically communicate with the CPU or microprocessor **84** and display unit.

A thermistor is a type of resistor used to measure temperature changes, relying on the change in its resistance with changing temperature. Thermistors can be classified into two types depending on the sign of k. If k is positive, the resistance increases with increasing temperature. If is negative, the resistance decreases with in decreasing temperature, and the device is called a negative temperature coefficient (NTC) thermistor.

It is anticipated by the Applicant that various types of thermocouples or thermistors can be used for the present invention. It is not important what type of thermocouple or thermistor is utilized for monitoring the water supply lines except that it is accurate for the appropriate temperature range monitored or measured.

To monitor or measure the flow rate of the water being delivered by the water supply line various flow measuring technologies are applicable to the present invention water meter.

The flow sensor **105** can be fabricated from pressure sensor technology. There are three general types of pressure sensors and each offers advantages and disadvantages for applied pressure monitoring operations. The three types are 1) absolute, pressure, 2) differential pressure measurement and 3) gauge pressure measurement. Absolute pressure references pressure in in a perfect vacuum. Differential pressure measurement compares the difference between two applied pressures. Gauge pressure measurement is a subtype of differential pressure measurement and compares the ambient atmospheric to the applied pressure. Pressure sensors can be utilized with the present invention for accurate monitoring or small leaks. Examples of pressure sensors are the pressure transducer (sensor) TI2C marketed by Anfield and for a differential sensor the Motorola MPX5700 series. Pressure sensors can be particularly useful in measuring small leaks by shutting of the water supply line and then monitoring the pressure loss over time.

There is also a category of pressure sensors that are designed to measure in a dynamic mode for capturing very high-speed changes in pressure. These sensors are commonly manufactured out of piezoelectric materials like quartz. Pressure sensors can perform as a flow rate sensor (e.g. the differential pressure gauges Motorola MPX5700) or be sensitive types that can sense pressure waves and pressure changes for water pattern analysis. One particular use would be to use the pressure sensor (e.g. ceramic capacitive pressure sensor) to monitor the pressure of a private or public property(ies) after a water control valve has turned off the water supply. The pressure sensor can then measure the decay in pressure reads to observe and indicate small leaks (dripping faucet).

Acoustic sensors are advancing to the point where they can monitor water flow and pressure readings that are approaching accurate quantifiable results. But acoustic sensor original function is to listen and record water valve noises and vibration frequencies. It is anticipated that all water devices have a valve with a unique "open" and "close" noise and vibration frequency. An acoustic sensor can therefore be significantly useful for identifying various water devices such as showers, washing machines, toilets, irrigation valves, bathroom and kitchen faucets, and other water fixtures and appliances. As each of the water use devices is used, the acoustic sensor can specifically identify the particular water use device. This is useful to characterizing water use as shown n FIG. **13**. It so useful in apartment or

condo situations where this is only a single water meter serving apartments or condos. The acoustic sensor will be able to characterize all the various water use fixtures, appliance and devices contain within these apartments and condos. The acoustic sensor can also be used to detect water leaks as water leaks make noises like water valves opening and closing. But water leaks (e.g. toilet flapper valves, dripping faucets) tend to have more continual noise patterns that can last for longer periods. The acoustic sensor identifies use water valve movements and noises when being opened or close, or observing vibrational frequencies when water is flowing past the water valve (toilet flapper valve). Proper billing for water use can then be accomplished without plumbing modifications. To supplement the acoustic sensor, various noise making orifices or vibration devices can be installed at various locations for identification by the acoustic sensor. With artificial intelligence (AI) and other programming software, the acoustic sensor can now monitor water flow characteristics. Like a flow rate sensor, the acoustic sensor with programming software can also monitor or add information to augment the flow rate, the duration and the total water volume to determine water signatures and patterns of water fixtures and appliances.

In addition, various flow measuring technologies can be utilized as the flow sensor **105**. In general, a flow sensor is a device for sensing the rate of fluid flow. Typically, a flow sensor is the sensing element used in a flow meter. There are various kinds of flow meters, including invasive (sensor movement within the tube or pipe) that have a vane, wheel, or turbine structure that is pushed by the fluid, and can drive a rotary potentiometer, or other similar device to monitor the flow rate. Flow meters can use a displacement piston, pushing it against a calibrated spring is a qualitative method and can only be used to show if the flow is on or off. Non-invasive flow rate sensors (sensor outside of the pipe) can be time-based or Doppler-based ultrasonic technology, or magnetic type flow sensors for measuring and recording water flowing through a tube or pipe.

The Pelton wheel turbine, paddle wheel and axial turbine translates the mechanical action of the specifically shaped objects rotating in the liquid flow around an axis that is translated into a user-readable rate of flow magnetic or optical monitoring technology. To function adequately, the specifically shaped object or paddle must be at least partially inserted into the water flow.

In addition, non-invasive (outside the water flow pathway) magnetic and ultrasound flow meters can be utilized with the present invention to function as the flow sensor **105**. Modern innovations in the measurement of flow rate incorporate electronic circuitry to correct for varying pressure and temperature. The magnetic flow meter, utilizes a magnetic field is applied to a tubular structure that has electrical insulating properties.

The ultrasonic flow meters can measure water flow using two methods: transit time and 2) doppler shift. Both methods are possible by use of modern electronics. The transit time method measures the difference of the transit time of ultrasonic pulses propagating in and against flow direction. This time difference is a measured for the average velocity of the water flowing through a specified path by the ultrasonic beam. The Doppler shift method monitors water flow rate by passing an ultrasonic beam through the water pipe, bouncing the beam off a reflective plate that reverses the direction of the beam, such that the flow rate of water flow can be estimated. The speed of transmission is affected by the movement of water in the pipe and by comparing the time taken to complete the cycle upstream versus downstream the flow of water through the pipe can be measured. The difference between the two speeds is a measure of true flow rate.

Fluid flow rate can be measured using monochromatic laser diode. The laser probe is inserted into a water stream and turned on, whereby the laser light scatters, and, a portion is reflected back to the probe. The signal is then electronically processed to calculate flow rate within the water pipe. The laser diode flow meter is more useful for relative rather than absolute measurements.

Multi-jet meters, positive displacement meter, single jet meters, pressure sensors, magnetic, ultrasound and Coriolis flow meters can be utilized with the present invention to function as the flow sensor **105**.

In addition, as shown in FIG. **4**, is an optional halogen (chloride or fluoride) sensor **78**, Total Dissolved Solids (TDS) sensor **132**, optional sensor **136** to measure or monitor the amount of iron and other metallic ions, biological or fecal coliform sensor **132**, optional pH sensor and optional water hardness sensor **134**.

Nor referring to FIG. **5**, which presents an example **110** of either the custom display/recorder **50** or the second optional (handheld) display/recorder **56**. The first display/recorder **50** or optional second (handheld) display/recorder **56** includes a housing or container **112**, display means **114**, **116**, and **118**, software control buttons **120**, **122**, and **124**, the electronic circuit board with wire or wireless capability, and power source are common between the two apparatuses. It is also anticipated that a third type of display/recorder (not shown) could utilized with computer, television or cell phone, smart phone or similar apparatus that has an internet, intranet, wire or wireless means. In this first display/recorder **50**, the second display/recorder **56**, or a third computer, television or cell phone, smart phone or similar electronic apparatus **400** can utilize custom software and/or market software that will be used to transfer the water parameter information from the water meter and leak detection system **10** (**126** shown in FIGS. **6** and **200** shown in FIG. **7**) to the first display/recorder **50**, the second display/recorder **56**, or the third computer, television, or cell phone, smart phone, computer or similar electronic apparatus **400**.

The display means **114**, **116**, and **118** can be programmed to display one or more parameters in a visual means that can utilize analog, character or digital display technology, or combination of the different display technology. Information obtained from the appropriate sensor monitoring or measuring the water parameters such as temperature, date/time, total volume over time, and flow rate can be displayed in an appropriate format on the display means. For example, when a sensor is monitoring or measuring the rate of water flowing from a water source and through the water meter and leak detection system **10**, **126**, the display means could show any flow between 0.1 gal/min (0.1 liters/min) to many thousands of gals/day.

Also shown in FIG. **5**, one or more ergonomically **120**, **122**, and/or **124** placed buttons or activators which can be incorporated into the display means housing to allow the modification of certain parameter units (e.g. metric to US), set alarm conditions (e.g. flow/volume rate-set points), or to program certain settings, e.g. over water use alarm, monitor continuous leakage, and/or control valve not complete shut off or completely open. The buttons will electrically communicate with the electronic circuit board contained with the housing or container **112** and respond to programmed instructions integrated within the CPU or microprocessor and associated circuitry of the electronic circuit board. The buttons or activators **120**, **122** and/or **124** should be mounted

with the display means housing **124** with the capability to protect the buttons and electronic circuitry with the housing for exposure to moist and wet, or freezing conditions.

Now referring to FIG. **6** is a perspective view of a plurality of optional water flow rate with transceivers located near or attached to water use appliances. The flow sensors/transceivers modules communicate wirelessly with the water meter and leak detection system **10**, **126** (and **200** in FIG. **7**) at various locations for monitoring water use and furthermore for monitoring for water leaks. Shown in FIG. **6** is water input supply line **121** connected to the water meter and leak detection system **10**, **126** (and **200** in FIG. **7**) and a water supply output **124**. The water then travels irrigation controller (shown as a box) with wireless connectivity module **120***a* that communicates with and the water meter and leak detection system **10**, **126** (and **200** in FIG. **7**) and having an irrigation input and output supply lines **122**. Also shown is a typical washing machine **128** with wireless connectivity module **120***b* that communicates with the water meter and leak detection system **10**, **126** (and **200** in FIG. **7**). Shower **123** with wireless connectivity devices (flow sensors/transceiver) module **120***c* that communicates with the water meter and leak detection system **10**, **126** (and **200** in FIG. **7**). The independent flow sensors/transceivers can also be located on water use devices such as sinks, toilets, hot water heaters **120***b*, bathtubs, dishwashers, pool filling equipment and the like.

The water meter and leak detection system **10**, **126** (and **200** in FIG. **7**) can include a series of water flow sensors or pressure sensors that can be connected to different locations, such as at the private and/or public property(ies) main indoor water supply and the irrigation system. In this way, the use of indoor water use (data acquired by the installed water meter and leak detection system **10**, **126** and **200** shown in FIG. **7**) and outdoor water (data acquired by flow or pressure sensor at irrigation system) use can be independently monitored. This Can be useful for an individual or commercial operator to employ water conservation methods (e.g., reduce the sprinkler frequency or duration). Alternately, the monitoring of indoor water use, and outdoor water use, could be utilized by the water supplying municipality or government agency to apply different rates for indoor water use and outdoor water use. In certain situations, a control valve can be located at a particular location, e.g. the irrigation valve whereby by utilizing the two-way wireless capability of the water meter and leak detection system **10**, **126** (and **200** shown in FIG. **7**), whereby the water supplying municipality or government agency can remotely control water use (e.g. send out a code that inhibits outdoor water use on certain days or at certain hours of the day).

The water meter and leak detection system **10**, **126**, (and **200** shown in FIG. **7**) can also communicate with the invasive flow sensor, non-invasive flow sensor, pressure sensors and/or sensitive flow sensors with transceivers to include software instructions for programming time intervals for water parameter data transmission.

Coordination of data packet transmissions from the invasive flow sensor, non-invasive flow sensor, optional pressure sensors, and optional acoustic sensors can be programmed to define a schedule to communicate or transfer data from each sensor. The water meter and leak detection system **10**, **126**, (and **200** shown in FIGS. **7** and **15**) can run a master schedule for querying each invasive flow sensor, non-invasive flow sensor, optional pressure sensors, and optional acoustic sensors. For example, water meter and leak detection system **10**, **126** (and **200** shown in FIGS. **7** and **15**) can transmit a message to a specific collection node and that collection node can then sequentially request data from each of its invasive flow sensor, non-invasive flow sensor, optional pressure sensors, and optional acoustic sensors. This systematic process can reduce data packet collision on the network and can make the water meter and leak detection system **10**, **126** (and **200** shown in FIG. **7**) immediately aware of any invasive flow sensor, non-invasive flow sensor and/or sensitive flow sensors with transceivers that might be having trouble transmitting its data packet. The water meter and leak detection system **10**, **126** (and **200** shown in FIG. **7**) can transmit an acknowledgement to each invasive flow sensor, non-invasive flow sensor and/or highly sensitive flow sensors with transceivers after successfully processing a data packet.

The software in the water meter and leak detection system **10**, **126** (and **200** shown in FIG. **7**) is designed to perceive water flow characteristics in the facility for a given unit of time, such as, for example, a day, for every unit in the facility. The software should be designed to identify numerous conditions, such as, for example, faulty toilet valves, periodic and irregular water flow for example toilets, irrigation leaks, faucets, and a slow (or fast) constant water flow, a characteristic of a leakage condition.

Referring to FIG. **7**, the water meter and leak detection system generally comprises a water meter and leak detection system **10**, **126**, **200** with water shut-off/on mechanism **310** strategically located between a main supply line **208** from a water main and a household water supply line **210** to a private and/or public property(ies) **202**. The water meter and leak detection system **10**, **126**, **200**, with water shut-off/on mechanism can be activated and deactivated by a remote controller **220** to selectively turn on and off the water through the household water supply line **210**. In the preferred embodiment of the present invention, the water meter and leak detection system **10**, **126**, **200** with water shut-off/on mechanism **310** is located with respect to the water supply line **208** such that water flow through the water supply line **210** to the living quarters of the private and/or public property(ies) **202** may be prevented while still allowing water flow to non-residential areas, such as to sprinkler lines.

It is anticipated by the Applicant that separate water shut-off/on mechanisms **310** can located on the water supply line **208** and the irrigation water supply lines. The multiple water shut-off/on mechanisms will have electrical circuitry and wireless radios such they can be controlled remotely through communication and commands/signals with the remote server over the internet from a cell phone APP. It is also anticipated by the Applicants that the water meter with leak detection system **10**, **126**, **200** with water shut-off/on mechanism **310** can take the place of, and function as, the main water meter and/or incorporate a pressure reduction valve (see FIG. **9**). FIG. **7** also shows the Water meter and leak detection system **10**, **126**, **200** with water shut-off/on mechanism **310** connected with a wired means **205** from a solar electrical generation **204** and/or connected with a wired means **207** from a wind electrical generation **206**. In this regard, the water meter and leak detection system **10**, **126**, **200** with shut-off/on mechanism **210** can be battery operated and utilize re-chargeable batteries or super capacitors that can be charged with a water turbine electric generator or have typical batteries that are replaceable. The water meter and leak detection system **10**, **126**, **200** with shut-off/on mechanism **310** can also be AC or DC powered. An antenna **322** is shown extending from the water meter collection node with water shut-off/on mechanism.

The housing for the water meter and leak detection system **10**, **126**, **200** (with water shut-off/on mechanism **310**) can be fabricated from a metallic or polymeric material with sealing technology to protect from moisture damage, excessive heat or freezing conditions.

The joint between the water supply lines **208** and **210** and the water meter and leak detection system **10**, **126**, **200** with water shut-off/on mechanism **310** could be screw and thread fitting, compression fitting, flare fitting, solder, brazed, or sweat joint, adhesive technology and/or use typical plumbing techniques. The joint may be designed to be permanent or removable.

The water meter and leak detection system **10**, **126**, **200** can incorporate a freeze design feature (not shown) which, before a freezing condition (water temperature approaching 32 degrees Fahrenheit or zero degrees Celsius) is encountered, activates a sacrificial freezing mechanism. It is anticipated that the water meter and leak detection system would contact the home or corporate owner bt text, email or call when the temperature approaches the freezing temperature (e.g. 2-3 degrees above freezing but can be based on historical data or a rapid decrease in temperature. This technology is commonly called "frost plugs" or "freeze plugs". This protects the more expensive water meter and leak detection system **10**, **126**, **200** and private and public building water distribution piping by sacrificing the less expensive and easy to install frost/freeze plug. The optional frost/freeze plug technology is typically used in outside underground pits or poorly heated garages or utility rooms. In some extraordinary freezing situations, the optional frost/freeze plug can be incorporated with a draining mechanism or system (not shown) that allows the water to passively drain from the private or public property(ies) water pipes or forcefully removes the water from the water pipes with a power system. Another method to protect from freezing conditions is to use a three-way control valve whereby the third port drains water from the private or public property (ies). Software will be designed to position the three-way control valve in all three positions. And it is anticipated that in these extraordinary freezing situations, the draining mechanism or system can also replace the water in the water pipes with air, nitrogen or other gas/liquid that have low freezing points and non-toxic conditions, that can withstand the freezing conditions to minimize damage to the water pipes. Furthermore, be communicating with a home router, the water meter and leak detection system **10**, **126**, **200** can communicate with intelligent thermostats sending a signal to turn on the residential or corporation heat to a temperature that will inhibit freezing water in the residential and corporation interior water pipes.

The water meter and leak detection system **10**, **126**, **200** with water shut-off/on mechanism **310** software controls when water is interrupted or allowed to flow into the private or public property(ies) facility or building, or to help program the for scheduled water interruption times (off from 8:30 a.m. until 4:30 p.m. then on, off again at 11:00 p.m. until 5:00 a.m. and then on again). A display means **211** can display calendar information, such as the date and current time (12 hr. or 24 hr. format). The water meter collection node **200** can be programmed using a wire or wireless technology such as an alarm system or use touch screen button technology on the display. The display and display housing must be able to sustain capability in outdoor wet and/or hot/freezing conditions. The display **211** can have a background light that is used for various purposes, for example, for providing better lighting conditions or changing color e.g. from green to red, to display an alarming condition. The display can utilize touch screen technology.

One of the key features of the water meter and leak detection system **10**, **126**, **200** is that it has a convenient means that facilitates activation and/or deactivation of the water flow from the main water supply when a private or public property(ies) facility or building when it becomes vacated or unsupervised. An vacated or unsupervised private or public property(ies) facility or building can utilized a passive infrared sensor (PIR sensor) is an electronic sensor that measures infrared light radiating from objects in its field of view. The PIR sensor can communicate wired or wirelessly with a router that sends a signal to the water meter and leak detection system **10**, **126**, **200**. Shown in FIG. **7**, is an individual **212** holding a cell phone, smart phones, or similar electronic mobile apparatus **400** for communicating with the water meter and leak detection system **10**, **126**, **200** to control the water flow.

For leak detection capability is would be, preferred that the water meter and leak detection system **10**, **126**, **200** with a water shut-off/on mechanism **310** include programming instructions with a timing circuit to allow a user to program a defined time schedule. In this manner, the private or public property(ies) owner may simply establish that the water supply will be shut, off or blocked during non-working hours, during a vacation, and/or during sleeping hours. The scheduling could be a daily, weekly, monthly or annual or on a water use basis. The Programming of the timing schedule could be input into the CPU of the water meter collection node or the communication hub (or receiving station) via various methods, e.g. wireless or wired communication with a computer with appropriate software, using the remote controller using touch screen technology on the display means, or cell phone, smart phones, or similar electronic mobile apparatus **400**. The vacation schedule can even be programmed, to turn on for the irrigation schedule to water the home or corporate plants, shrubbery or ground cover. This modified programming will turn off the supply water during a vacation and automatically turn on the supply water when the irrigation controlling is programmed to water the yard or area, e.g. 6-8 a.m. on Monday, Wednesday and Friday.

Now referring to FIG. **8**, shown is a perspective more detailed view of the water meter and leak detection system **10**, **126**, **200** with water shut-off/on mechanism **310** and water supply plumbing, and with optional water turbine generator **308** that is located within the water supply line. The water supply line from the water main **208** can optionally include a manual shut off valve **300** with handle **302**. The manual shut off valve **300** can be a ball valve, solenoid valve, gate value type, piston valve, or other known technology. Further along the water supply line is an optional pressure regulator **304** with a connecting pipe **306** to the water meter and leak detection system **10**, **126**, **200** with water shut-off/on mechanism **310**. The optional water turbine generator **308** could be utilized to produce electrical energy for recharging the rechargeable battery source **326**. The water shut-off/on mechanism **310** can be a ball valve, solenoid valve, gate value type, piston valve, or other known technology with electronic activation. A mechanical lever or electric button/toggle switch **311** can be incorporated on the water shut-off/on mechanism to allow the modification of the mechanism to open or close the water flow in emergency and necessary situations. The water meter and leak detection system **10**, **126**, **200** has a transceiver **320** that includes an antenna **322** which can be external or internal. The control circuit for the water meter and leak detection system **10**, **126**,

200 shown in more detail in FIG. 3, includes programmable CPU, a power source using either a battery or super capacitor (rechargeable) 326 or typical AC or DC supply 324, and/or electrical circuitry, wireless or hard-wired components, and optional sensors and associated circuitry. Also shown is a battery voltage 326 which would electronically engage the optional solar cell 302 or wind generator 206 to provide additional electrical energy. It is anticipated by the Applicant's that the water shut-off/on mechanism 311 (ball valve or solenoid shutoff valve), and if used, the optional water turbine generator 308, could be incorporated within the water meter and leak detection system 10, 126, 200 as a single unit. It is also anticipated that the water meter and leak detection system 10, 126, 200 with water shut-off/on valve 310 could replace and additionally include the function of a pressure regulator (see FIG. 9), eliminating one of the components shown in this drawing. Exiting from water meter and leak detection system 10, 126, 200 with water shut-off/on mechanism 310 is the main water supply 312 to the private or public property(ies) building or structure. It is also anticipated that water meter and leak detection system 10, 126, 200 with water shut-off/on valve 310 could replace, and function as, the main water meter.

FIG. 9 is another embodiment of the water meter and leak detection system 10, 126, 200 with a perspective detailed view of the water shut-off/on mechanism combined with an independent pressure regulator or reduction valve and functioning as a combined system consisting of a water meter collection node with one or more water flow sensors having a water shut-off/on mechanism and pressure reduction valve. Shown is a typical water pressure reduction valve 304 connected directly with the water meter and leak detection system 10, 126, 200 with water shut-off/on mechanism 200 having a ball valve 310, a manual on-off handle 311, an electric motor 315, electrical circuitry 314 with a wireless antenna 322.

Now referring to more detail in FIG. 10, (with additional application programs, or APPs as shown in FIGS. 11, 12, 13) where water parameter data can be display on a cell phone, smart phone, computer and other electronic apparatus 400 as defined herein.

FIGS. 10-13 show a cell or smart phone, computer, or other apparatus 400 running an "APP" or a sequence of "APP" pages that show, in a pie chart, bar chart, or other format, the water uses of particular areas of the private and or public property(ies). The water meter and leak detection system's flow rate sensor(s) and software uses calculations from the water flow rate, water use duration, and total volume of water to differentiate water use devices (e.g. shower, faucet, bathtub, toilet, washing machine, water heater, dishwasher, and outside irrigation system) can be to show the water uses. Other outdoor water uses such as pool or hot tub or water fountain water maintenance can be included for water use monitoring. The addition of an acoustic sensor can monitor valve movement, vibration, and noise patterns (sound and pressure patterns) which can sense water valve position or movement, with the water meter and leak detection system 10, 126, 200 can provide more specific differentiation of water use devices. Using AI software technologies, the acoustic sensor could be calibrated to monitor water rate flow and water pressure.

The cell phone, smart phone or other electronic apparatus 400 or custom display and/or a recording apparatus 50, 56 and 110 has the convenient function of providing an individual or entity to review water use and water parameter data on a real time basis for auditing or monitoring purposes. The wireless communication means can use radio-frequency, Bluetooth, Bluetooth low energy ZigBee Wi-Fi, Wi-Fi3, LoRa, 6LoWPAN, Ultra Narrow Band (UWB), standard cellular or advanced 3GPP, NB-IoT, LTE-M and 5G cellular technology or other wireless technology for transferring the water parameter data generated by the sensors and collected by the microprocessor and sent by wireless communication technology for data transfer through either a private or public network system and/or the optional collection hub or receiving station to an Internet router. And command signals can be sent back to the water meter and leak detection system 10, 126, 200 with water shut-off/on mechanism 310 or software updates, activate or deactivate the water shut-off/on mechanism. Examples of Bluetooth modules (using the 2.4 GHz band) that can be utilizes by the present invention are the RN-41 Bluetooth modules available from Roving Networks in Los Gatos, Calif., the KC-41, KC 11.4, KC-5100, KC-216 or KC-225 data serial modules from KC Wireless in Tempe Ariz., the Proton or Electron from Particle (formally Spark) in San Francisco and/or the BT-21 module from Amp'ed RF wireless solutions in San Jose, Calif. Examples of wireless protocols that can be utilized with the present invention include, but are not limited to, the IEEE 802.11a, IEEE 802.11b, IEEE 802.11g, and IEEE 802.11n, and IEEE 802.11x modulation techniques and the newer protocol associated with Wi-Fi3. Another example of the wireless protocols that can be utilized with the present invention is the ZigBee, Z-wave and IEE 802.15.4 modulation technology. Furthermore, wireless low power and long-range technology known as "LoRa" marketed by many manufactures such as Semetech and the HopeRF RFM95 W-91552 can be used with the present invention. Ultra Narrow Band chips are marketed by Texas Instruments as CC1125 Ultra High-Performance RF Narrowband Transceiver. Applicants recognize that there are numerous wireless protocols that have been developed that, although not specifically listed, could be utilized with the present invention for data transfer purposes.

The water meter and leak detection system 10, 126, 200 with water shut-off/on mechanism 310, can transmit water parameter data to a router that connects to the internet and then to remote computers/servers, can also communicate the water leak condition with a user or owner of a home, condo, apartment or other residence, rental/leased house, condo or apartment or other resident, owner or representative of a company or corporate entity, owner or staff of a hotel/motel, institution facility, and/or a governmental agency, housing or facility using a cellular format technology that refers to all current and future variants, revisions and generations (e.g. third generation (3G), fourth generation (4G), fifth generation (5G) and all future generations) of Global System for Mobile Communication (GSM), General Packet Radio Service (GPSR), Code Division Multiple Access (CDMA), Evolution-Data Optimized (EV-DO), Enhanced Data Rates for GSM Evolution (EDGE), 3GSM, Digital Enhanced Cordless Telecommunications (DBCT), Digital AMPS (IS-136/TDMA, Integrated Digital Enhance Network (iDEN), HSPA+, WIMAX, LTE, Flash-OFDM, HIPERMAN, WiFi, IBurst, UNTS, W-CDMA, HSPDA+HSUPA, UMTS-TDD and other formats for utilizing cell phone technology, telephony antenna distributions and/or any combinations thereof, and including the use of satellite, microwave technology, the internet, cell tower, telephony and/or public switched telephone network lines. The wireless communication of water leaking conditions can be between the water meter and leak detection system 10, 126, 200 with water shut-off/on mechanism 310 and a cell phone, smart phones, or other electronic apparatus 400 includes all remote cellular

phones defined above (with cellular equipment, public switched telephone network lines, satellite, tower and mesh technology), mobile phones, PDA, tablets (e.g. refers to all current and future variants, revisions and generations of the Apple™ IPAD™, Samsung™ Galaxy™, HP™, Acer™, Microsoft™, Nook™, Google™ Nexus™, Sony™, Kindle™ and all future tablets manufactured by these and other manufactures), Apple™ IPOD™ Touch™, or a television, watch, timepiece or fob watch and other similar apparatus with Wi-Fi and wireless capability, and remote computers and controllers having internet or wireless connectivity. The display of the water leaking condition data can be in various pleasing format using digits, analog display, graphics, pictures, charts and/or other characters to exhibit the leaking condition to, a user. Also, the transfer of data can use authentication, encryptions, integrity and non-repudiation technology to ensure that data or information is communicated securely.

The water meter and leak detection system **10**, **126**, **200** with water shut-off/on mechanism **310** can also function to monitor the water use in homes, companies, buildings or other structures by including either sensitive flow sensors, standard invasive flow sensors, (e.g. turbine, Pelton, paddle wheel flow, piston, and pressure sensors and other invasive sensors), non-invasive flow use sensors (e.g. Doppler or time-transit ultrasonic, laser or magnetic flow sensors and other non-invasive flow use sensors) to communicate either or both the inside and/or irrigation water flow use on a real time daily, weekly, monthly, and/or yearly basis or on a water use basis. Such water flow use data can be transferred to a remote central monitoring computer service, municipality or government agency, via cell towers, satellite, microwave technology, the internet, telephone lines, and the like. The water meter and leak detection system **10**, **126**, **200** that transfer water parameters and data to the internet and to remote computer/servers can also communicate, with a user or owner of a home, condo, apartment or other residence, rental/leased house, condo or apartment or other resident, owner or representative of a company or corporate entity, owner or staff of a hotel/motel, institution facility, and/or a governmental agency, housing or facility using a cellular format technology that refers to all current and future variants, revisions and generations (e.g. third generation (3G), fourth generation (4G), fifth generation (5G) and all future generation) of Global System for Mobile Communication (GSM), General Packet Radio Service (GPSR), Code Division Multiple Access (CDMA), Evolution-Data Optimized (EV-DO), Enhanced Data Rates for GSM Evolution (EDGE), 3GSM, Digital Enhanced Cordless Telecommunications (DECT), Digital AMPS (IS-136/TDMA, Integrated Digital Enhance Network (iDEN), HSPA+, WiMAX, LTE, Flash-OFDM, HIPERMAN, Wi-Fi, IBurst, UMTS, W-CDMA, HSPDA+HSUPA, UNTS-TDD and other formats for utilizing cell phone technology, telephony antenna distributions, and/or any combinations thereof, and including the use of satellite, microwave technology, Wi-Fi, WIMAX, Wi-Fi3, LoRa technology, the internet, cell tower, telephony and/or public switched telephone network lines. The wireless communication of real time, daily, monthly, weekly, monthly, and/or yearly water indoor and irrigation water use can be between the water meter and leak detection system **10**, **126**, **200** and a typical cell phone, smart phones, or other electronic apparatus **400** includes all remote cellular phones using (with cellular equipment, public switched telephone network lines, satellite, tower and mesh technology), mobile phones, PDAs, tablets (e.g. refers to all current and future variants, revisions and generations of the Apple™ IPAD™, Samsung™ Galaxy™, HP™, Acer™, Microsoft™, Nook™, Google™ Nexus™, Sony™, Kindle™ and all future tablets manufactured by these and other manufactures), Apple™ IPOD™ Touch™, or a television, watch, timepiece or fob watch and other similar apparatus with Wi-Fi and wireless capability, and remote computers and controllers having internet or wireless connectivity. The display of the indoor and irrigation water use data can be in various pleasing format using digits, analog displays, graphics, pictures, charts and/or other characters to exhibit the water use to a user. Also, the transfer of data can use authentication, encryptions, integrity and non-repudiation technology to ensure that data or information is communicated securely. The sensitive water flow sensors, standard invasive flow sensors, (e.g. turbine, Pelton, paddle wheel flow, piston, and pressure sensors and other invasive sensors), non-invasive flow use sensors (e.g. Doppler or time-transit ultrasonic, laser or magnetic flow sensors and other non-invasive flow use sensors) with transceivers can have an extended battery life by utilizing the interval wireless communications or transmissions and with a long lasting battery pack, such as, for example, the Tadiran series of batteries manufactured by Tadiran U.S. Battery in Lake Success, N.Y. Some candidates for use with the present invention water meter with leak detection system **10**, **126**, **200** are the standard or rechargeable lithium industrial type batteries, LiSOCl.sub.2 bobbin or serial type batteries, one or more super capacitors, or LiSOCl.sub.2 bobbin type with hybrid supercapacitor. Or with a turbine, paddle wheel or Pelton wheel energy generator **95** in hydraulic communication with the water supply line, solar energy, or wind energy, a rechargeable battery or super capacitor can be utilized. In addition, the batteries can be recharging type and accessed with an electrical coupler accessed from the outside of the sensitive flow sensors with transceivers. Or the flow sensors can be powered by low voltage AC e.g. 24 volts AC, or DC current. High voltage current e.g. 240 or 120 volts can also be used and if necessary, the voltage, can be reduced with transformers and the like.

FIG. **12** shows the water meter and leak detection system APP, which manages the water control valve mechanism enabling one to turn the water supply on/off, to program a water on/off schedule, and to receive notification of a leak condition with the option to remotely turn off the water supply. The water meter and leak detection system's flow sensor(s) **105** can communicate wirelessly or wired **101**, **102**, **103** with the microprocessor, CPU or microcontroller **84** that has software that learns about water usage at a Private or public property(ies) or areas thereof.

Referring to FIG. **12**, which shows a perspective view of a typical cell phone, smart phones, or similar other electronic apparatus **400** having an application **410**, commonly known as an "APP", programmed to display soft buttons or use control activators on a cell phone, smart phone, or similar apparatus **400**, designed to wirelessly communicate or send signals to and from the water meter and leak detection system **10**, **126**, **200** with water shut-off/on mechanism **310**. It is also anticipated that the apparatus **400** could be an Apple™ IPAD™, HP™, Samsung™, LG™, or other manufacture's tablet and that the application **402** that would function as described below. Furthermore, apparatus **400** could be a remote computer or television that is connected to the internet or has wireless capability. Shown in FIG. **12A** is an example of an application **410** which will typically display soft buttons for controlling water on **404** and water off **406** by sending wireless instructions to the water meter with leak detection system **10**, **126**, **200**. It is anticipated by

the Applicant that other configuration of application displays for remotely communicating with the Water meter and leak detection system **10**, **126**, **200**. The application **410** can also have a soft schedule button **408** which sequentially adds displays for entering a predetermined schedule for turning on and off the water at the collection node of the Water meter and leak detection system **10**, **126**, **200**. The predetermined schedule can be sent to the water meter with leak detection system **10**, **126**, **200** for continuous sequencing operations on an hourly, daily, weekly, monthly or yearly basis. The predetermined schedule can be programmed into a memory module at the water meter and leak detection system **10**, **126**, **200**.

An option of the application **410** is shown as a decisional text message **413** inquiring if the individual, would like the water turned off and sent to display **402** of the cell phone, smart phone or apparatus **400**. The cell phone, smart phone or other electronic apparatus **400** would preferably have incorporated GPS technology that can determine the location of the cell phone, smart phone or similar apparatus, and know or saved the home or water meter with leak detection system **10**, **126**, **200** locations. Triangulation techniques between cell towers can also be used if the cell phone, smart phone or other electronic apparatus **400** does not have GPS capability. The application **402** could or will have a routine that can program the distance from the water meter and leak detection system **10**, **26**, **200** that an individual desire to be provided a notice of the decisional text message. If the water is not turned off when the individual leaves the private or public property(ies), and the cell phone, smart phone or other electronic apparatus **400** has been programmed for a set distance from the water meter collection node or optional communication hub e.g. ¼ mile, then the decisional text message **417**, for example, "Should I turn off the water supply", will be sent to the cell phone, smart phone or other electronic apparatus **400**. The rational for the decisional text message is that, for the present invention to function as a water damage prevention system, substantial compliance with routine turning off the water when a private or public property(ies) in unoccupied is necessary. The decisional text message **417** provides the individual a soft button "yes" **412** to turn off the water at the collection node of the Water meter and leak detection system **10**, **126**, **200** or "no" **414** and leave the collection node of the water meter and leak detection **10**, **126**, **200**, with the water control valve on. Hard button activators **416***a*, **416***b* and **416***c* can also be used to communicate with the water meter and leak detection system **10**, **126**, **200** that transfers water parameter data to the internet and then to remote computers/servers for cell phones, smart phones or a similar other electronic apparatus that a display screens or no touch screen capability. For example, hard button **416***a* can communication with the water meter and leak detection system **10**, **126**, **200** to turn the water system on, hard button **416***b* can communication with the water meter and leak detection system **10**, **126**, **200** to turn the water system off, and hard button **416***c* can communication with water meter and leak detection system **10**, **126**, **200** to open a schedule page.

Another optional decisional text message **410** can sent to the cell phone, smart phone or other electronic apparatus **400** if one of the optional highly sensitive flow sensors and **123** detects a leaking condition. The text message could specify "Leak found in kitchen area, should I turn of the water supply". The decisional text message **410** provides the individual a soft button "yes" **412** to turn off the water at the water meter and leak detection system **10**, **126**, **200** or "no" **414** and leave the water meter and leak detection **10**, **126**, **200** with the water control valve on. Hard button activators **416***a*, **416***b* and **416***c* can also used to communicate with the water meter and leak detection system **10**, **126**, **200** for cell phones, smart phones or a other electronic apparatus that a limited display screens or no touch screen capability. This optional leak detection message could also be sent the insurance or municipality agency monitoring station by PSTN or wireless means to notify of the leakage condition. It is also anticipated by the Applicant that the leak detection message could also be transferred to the supplying municipality to inform them of the leak such that the municipality can act to repair the leak condition.

Shown below in this FIG. **10** is a perspective view of an "APP" or programmed application that provides water use data in various example formats that is transferred from the water meter collection node or optional communication hub to a remote display/recording apparatus **18**, **50**, **56**, or a remote computer or a cell phone, smart phone, or other electronic apparatus **400**. The programmed application or APP shows an average time of water use data, average water use data, water cost data, energy calculations using the water heater type, the state located, cost of natural gas or oil per Therm, efficiency information, and the average ambient water temperature and the desired water temperature use for hot water devices (e.g. shower, faucets). On the bottom of FIG. **16** is the water energy calculation and water costs for the day, week, month, year, and 2-year dates. The Applicant contends that many different water energy calculations can be used with the present invention without deviated from its intended use. The water meter and leak detection system can communicate with a said typical cell phone, smart phones, or other electronic apparatus includes an application for a consumer/resident, corporate entity, or municipality that show the daily, weekly and/or monthly water use and/or daily, weekly or monthly water costs.

Shown in FIG. **11** is a perspective view of a first example application (APP), or a first page of an application (APP) **300**, displayed on a typical cell phone, smart phone or other electronic apparatus **400** (see FIGS. **12** and **13**). This example application (APP) or page **300** is designed as a line graph format to be used by the resident of a home or a representative of a company or a corporation to monitor water conservation, but is it anticipated by the Applicant that the application (APP) **300** could be used by municipal or government representatives.

FIG. **11** shows and example of an application or page (APP) **300** for Water Use **302** having a daily **304** graph **306** with day hours **308**, designated by the symbol AM **312** and the night hours **310** designated by the symbol PM **314**. At the right side of the example application or page (APP) **300** is the daily total use of water **316** and the daily total cost in dollars (or other currency) **318** that has been downloaded the data **340** from the registered or serving water municipality. Within the daily graph **306** is a plotted line **307** that shows the hourly water use. The plotted line **307** can have a rolling feature whereby new data replaces the oldest data in the graph. A gallon or liter scale can be included on the left side of the daily graph **305** (not shown).

The example of an application or page (APP) **300** for Water Use **302** can also have a weekly **320** graph **322** with days **324**. At the right side of the example first application or page (APP) **300** is the weekly total use of water **326** and the weekly total cost in dollars (or other currency) **328** that has been downloaded the data **340** from the registered or serving water municipality. Within the weekly graph **322** is a plotted line **327** that shows the daily water use. The plotted line **327** can have a rolling feature whereby new data

replaces the oldest data in the graph. A gallon or liter scale can be included on the left side of the weekly graph **322** (not shown).

The example of an application or page (APP) **300** for Water Use **302** can also have a monthly **334** graph **330** with months **332**. At the right side of the example first application or page (APP) **300** is the monthly total use of water **336** and the monthly total cost in dollars (or other currency) **338** that has been downloaded the data **340** from the registered or serving water municipality. Within the monthly graph **330** is a plotted line **337** that shows the daily water use. The plotted line **337** can have a rolling feature whereby new data replaces the oldest data in the graph. A gallon or liter scale can be included on the left side of the monthly graph **330** (not shown).

The water meter and leak detection system **10**, **126**, **200** is designed to transfer data and information by utilizing the wireless communication with the one or more remote display and/or recorder apparatus, or cell phone, smart phone or other electronic apparatus whereby the remote display and/or recorder apparatus or cell phone, smart phone or other electronic apparatus can automatically convert back and forth from radio frequency format, ZigBee or Bluetooth format to a cellular format technology to accommodate different range requirements.

FIG. **11** shows a Download Button **340** which is designed to manually or automatically download water rate and expense data from the servicing and registered water municipality or other source. The cost per gallon, hundred cubic feet (HCF) or other measurement is usually dependent on volume used over a given period. For example, from 0-8 HCF could be billed at $3.64 per BCF, 9-24 HCF could be billed at $4.08 per BCF, and 25-36 HCF could be billed at $5.82 per HCF. This is only an example data that can be downloaded and utilized to determine the daily cost **318**, weekly cost **328**, or monthly cost **338**. Other data can be downloaded from the water municipality or other source such as warnings for drought conditions, metering policies, quality messages, limits, alarms, etc.

FIG. **11** also depicts a user, whether it is a home owner or company representative, who can Set Limits **342** for water use to command the water meter and leak detections system **10**, **126**, **200** to turn the water completely off for example, if a limit of water flow exceeds a limit, or sound a verbal or audio alarm. It is anticipated that the servicing and registered water municipality or other source can upload Set Limits **342** to the individual water meter and leak detections system **10**, **126**, **200**. It addition, the Set Alarms **344** for water use can be used to display visually or provide audio signals of alarming conditions associated with the daily, weekly or monthly water use. The application (APP) **300** is designed to promote water conservation and monitor for leaking conditions.

FIG. **11** also shows an optional Water Quality section **350** of the application (APP) **300**. As shown, optional water quality Sensor **1** (one) **352** can monitor one or more halogen elements or compounds, monitoring total dissolve solids, monitoring a metallic or iron element or compound, monitoring water hardness, monitoring biological or coliform contaminates, monitoring pH, or any combinations thereof. The plotted line **358** for Sensor **1** (one) shows peaks and valley over the time period **360**. The time period can be selected for daily, weekly or monthly. Sensor **2** (two) **354**, can be another water quality sensor and Sensor X **356** can be one or more water quality sensor taken from the group define above.

For the optional Water Quality sensors **350**, shown is a Frequency Soft Button which allows the user to define the time period, daily, weekly or monthly. A user, whether it is a home owner or company representative, who can Set Limits **372** for water quality to command the water meter and leak detection system **10**, **126**, **200** to turn the water completely off, limit the flow, or sound a verbal or audio alarm. It is anticipated that the servicing and registered water municipality or other source can upload Set Limits **372** to the individual water meter and leak detection system **10**, **126**, **200** (with water shut-off/on mechanism **310**). It addition, the Set Alarms **374** for water use can be used to display visually or provide audio signals of alarming conditions associated with the daily, weekly or monthly water use.

As FIG. **11** is only an example of presentation of the water use and water quality data, it is anticipated that other formats for displaying the daily, weekly, monthly, or annual water use and water quality use. Such formats can be in bar graph format, pie graph format, cosmography formats, tabular formats, time series graph formats, histogram formats, data plot format, scatter plot format, other graph formats, or a combination of these graph formats. In addition, it is anticipated that the water flow data presented in line graphs, tabular formats or graphic formats or any combination of the formats listed herein can be presented on one or more pages or screens of the typical cell phone, smart phone or similar apparatus.

FIG. **12** shows one or more visual signals **409**, **411** (e.g. LED or LCD) lights that are turned on (and off after a period of time) to communicate to an individual that the water meter and leak detection system **10**, **126**, **200** with water shut-off/on mechanism **310** has completed the programmed activity. For example, only, **409** could be a red LED light that illuminates when the water system is turned off and **411** could be a green LED light that illuminates when the water system is turned on. It is anticipated by the Applicant that verbal signal (verbal "water off" or verbal "water on" or simply a playing certain ringtones) can also be used to communicate that the programmed activity has been completed. Also shown near the middle of the "APP" (program) page is a soft button **404** for turning on the water system and anther soft button **408** for turning off the water system. A labeled **407** soft button **408** is used to bring up another page(s) that allows an individual to input a water on/off schedule. For example, one can have the water system or supply turned off automatically Monday-Friday from 8:00 a.m. until 5:00 p.m. when all residences have vacated the residence (e.g. at work or school). For business and companies, the scheduling soft button **408** can turn off the water system or supply automatically when the employees of the business or company are vacated (e.g. from 6:00 p.m. until 7:00 a.m. Monday-Friday and all-day Saturday-Sunday. Various hard buttons **416**A, **416**B, and **416**C can be used to supplement the soft buttons and/or menu pages for movement within the page or inputting data. On the bottom of the "APP" (program) is a text message sent to the home owner or resident or business or company employee the option to turn on or off the water system or supply if the water meter and leak detection system is aware that the home, building or company is vacated (e.g. by temporal measurements, passive infrared sensors, entry and/or exit (badge) identification information. Shown on the side are the Bluetooth **420**A, Wi-Fi **420**B and cellular communication **420**C means that wirelessly connects the cell phone, smart phone or similar apparatus **400** to the water meter and leak detections system **10**, **126**, **200**.

Typical cell phones, smart phones, and other electronic apparatuses **400** may have one or more means of communication that can be established with a particular water meter and leak detections system **10**, **126**, **200** for wireless communication. The use of Bluetooth wireless technology **420***a* is commonly a feature found on many cell phones, smart phones and similar apparatus. Such Bluetooth wireless communication **420***a* can be a means to communicate with the water meter and leak detection system **10**, **126**, **200** with water shut-off/on mechanism **310** to turn the water on or off or receive decisional text messages **410**. Zigbee is another wireless technology that can be used. However, most current cell phones, smart phones or other electronic apparatus **400** do not possess Zigbee wireless capability.

The use of Wi-Fi (IEEE 802.11 family of wireless local area network) and upcoming Wi-Fi3 wireless technology **420***b* is commonly a feature found on many cell phones, smart phones and similar apparatus **400** and wireless routers/servers. Such Wi-Fi wireless communication **420***b* can be a means to communicate remotely from a router server directly to, or by the communication hub circuitry to the collection node circuitry of the water meter and leak detections system **10**, **126**, **200** with water shut-off/on mechanism **310** to turn the water on or off or receive text messages. The water meter and leak detection system **10**, **126**, **200** can have the capability to receive and transfer wireless signals and decisional text messages **410** using Wi-Fi technology directly to the water meter and leak detection system **10**, **126**, **200** with water shut-off/on mechanism **310**. Alternately, the Wi-Fi communication **420***b* will communicate with a wireless router/server that has a HTML or other communication-based interface and configuration page graphic user interfaces. Remote access from the cell phone, smart phone or similar apparatus **400** could use a short message service (SMS) interface and/or voice of Internet Protocol (VOIP) which communicates with the wireless router. This Wi-Fi technology will access the Internet through the wireless router and can recognize the cell phone, smart phone or other electronic apparatus **400** phone number for remote capability using SMS interface. A digit numbers security can be used to maintain restricted integrity. Wireless Transmitters and Receivers can be used for Wi-Fi communication **420***b* to the water mater and leak detection system **10**, **126**, **200** for individuals lacking internet capability at their residence.

The use of cellular wireless technology **420***c* is a primary feature of cells phones, smart phones and similar apparatus. Such cellular wireless communication **420***c* can be a means to communicate with the water meter and leak detection system **10**, **126**, **200** with water shut-off/on mechanism **310** to turn the water on or off or to receive text messages.

The application **410** an have to interface with the Bluetooth **420***a*, Wi-Fi **420***b*, or cellular **420***c* wireless communication means, and send instructions for a specific pairing operation for a water meter and leak detection system **10**, **126**, **200** with water shut-off/on mechanism, the pairing operation allows for access to 1) observe the recorded data or 2) prevent an unauthorized individual to regulate the water control valve. Various pairing methods between the water meter and leak detection system **10**, **124**, **200** with water shut-off/on mechanism **310** and the cell phone, smart phone or other electronic apparatus **400** are contemplated to be necessary to ensure that proper communication is established between a single and unique water meter and leak detection system **10**, **126**, **200** in addition to one or more unique cell phone, smart phone or other electronic apparatus **400**. A Quick Response Code (QR code) unit address located on water meter and leak detection system **10**, **126**, **200** can communicate with a cell phone, smart phone or other electronic apparatus **400** having a camera to read QR and establish link to the water meter and leak detection system **200**. Standard barcodes or QR codes could pair and establish a link between the water meter and leak detection system **10**, **126**, **200** with water shut-off/on mechanism **310** and the cell phone, smart phone or other electronic apparatus **400**. Near field link and RE ID chip technology can also be used to facilitate pairing and establish a link between the water meter and leak detections system **10**, **126**, **200** and the cell phone, smart phone or other electronic apparatus **400**. Currently bar code readers are applications that can be downloaded for a particular cell phone, smart phone or similar apparatus operation system. Near field links are only recently becoming available on Samsung smart phones, but this technology may be expanded to many, if not all, cell phones, smart phones or similar apparatus.

In operation, an individual who wants to turn off the water system would touch the off the soft button **408** or reply to the text message to turn off the water system "yes" soft button **412**, or push the hard button **416***b* on the a cell phone, smart phone or other electronic apparatus **400** which will communication with the water/energy use monitoring display apparatus **10**, **200** via the Internet, wireless technology (e.g. Bluetooth, ZigBee, Wi-Fi, Wi-Fi3, Ultra Narrow Band (UNB), LoRa, WiMAX, 6LoWPAN, and/or cellular format technology (NB-IoT, standard cellular GSM/CDMA technology, cellular GPP, cellular LTE-M and 5G) and then the paired water meter and leak detection system **10**, **126**, **200** with water shut-off/on mechanism **310** would turn off the water system off and then when completed (specified by switches and/or a flow sensor) will send a returned communication signal to the a cell phone, smart phone or other electronic apparatus **400** and turn on signal (audio or visual) message **409** that the water system is off. Comparable, an individual who wants to turn on the water system would touch the "on" the soft button **404** or reply to the text message to turn off the water system **410** "no" soft button **412**, or push the hard button **416***a* on the a cell phone, smart phone or similar apparatus **400** which will communication with water meter and leak detections system **10**, **126**, **200** with water shut-off/on mechanism **310** via the internet, wireless technology (e.g. Bluetooth, ZigBee, Wi-Fi, Wi-Fi3, Ultra Narrow Band (UNB), LoRa), WiMAX, 6LoWPAN and/or cellular format technology (NB-IoT 6LoWPAN, standard cellular GSM/CDMA technology, cellular 3GPP, cellular LTE-M, NB-IoT and 5G) and then the paired water meter and leak detection system **200** would turn off the water system off and then when completed (specified by switches and/or a flow sensor) will send a returned communication signal to the a cell phone, smart phone or other electronic apparatus **400** and turn on signal (audio or visual) message **409** that the water system is off.

FIG. **13** is a perspective view of the embodiment comprising a home with the water meter and leak detection system **10**, **126**, **200** (with or without the water shut-off/on mechanism **310**) interposed within the main water supply system **208** and the first distribution line for the home or company **310** and communicating wirelessly with a cell phone, smart phone or similar apparatus **400** held in the hand **221** of an individual **212**. The cell phone, smart phone, or similar apparatus **400** communicates with the water meter and leak detections system **10**, **126**, **200** using Bluetooth or ZigBee wireless technology **420***a*, Wi-Fi wireless communication **420***b*, WiFi3, LoRa and/or cellular wireless technology **420***c*.

FIG. **14** is block diagram of the overall system showing the software, hardware and software applications of the private or public property(ies) communicating with the water meter and leak detection system **10**, **126**, **200** and communicating with the internet and remote computer service station ("the Cloud"). The water meter and leak detection system **10**, **126**, **200** (with water shut-off/on mechanism **310**) includes, a preferred, but optional receiving station or communication hub **477** that connects either hard wired or wireless to a router/server **438** which connects in a duplex communication **440**, **441** to the internet **434**. The Internet has duplex communication **461**, **462** with the Remote Computer/Server Service Center **452** (e.g. Amazon™, Microsoft™, Oracle™ and Google™). Within the Remote Computer/Server Service Center communicating with a cell or mobile phone, smart phone, or other electronic apparatus **400**, smart internet TVs, smart central hub listening and speaker devices, and home control systems (**408**). At a user's private or public property(ies), the water meter and leak detection system **10**, **126**, **200** (with water shut-off/on mechanism **310**) connects to the router/server **438** with authentication, and preferable encrypted data. The water meter and leak detection system **10**, **126**, **200** (with water shut-off/on mechanism **310**) system communicates with the remote computers **452** located in the service provider's data center or hosted in integrated security system data center), with the communication taking place via a communication network (e.g., cellular network, internet, etc.).

The cell or mobile phone, smart phone, or other electronic apparatus **400**, remote computer, smart internet TVs, smart central hub listening and speaker devices, and home control systems, can be used to wirelessly communicate with the water meter and leak detection system **10**, **126**, **200** (with water shut-off/on mechanism **310**) via router/internet/remote servers to perform various functions and include numbers capabilities. The cell or mobile phone, smart phone, or other electronic apparatus **400**, computer, cell phone, smart phone and similar apparatus, smart internet TVs smart central hub listening and speaker devices, and home control systems, preferably have downloaded programs or applications) ("APPs") that communicated with the water meter and leak detection system **10**, **126**, **200** (with water shut-off/on mechanism **310**) for displaying water us e energy use and water quality as described herein. The cell or mobile phone, smart phone, or other electronic apparatus **400**, remote computer, smart Internet TVs, smart central hub listening and speaker devices, and home control systems, that downloaded program or applications ("Apps") can specifically turning on and off the water supply to a private or public property(ies) either directly using a soft button of the APP or program a schedule using the APP. The water meter and leak detection system **10**, **126**, **200** (with water shut-off/on mechanism **310**) is not only designed to monitor for water use, energy use, and water quality, but to monitor of leak detection, conditions and provide text messages, alerts signals, or emails regarding water leak conditions. The water meter and leak detection system **10**, **126**, **200** (with water shut-off/on mechanism **310**) can be programmed by the user to automatically shut off the water supply when a leak condition is observed. For purposes of brevity, water use data, water energy data, water quality data and leak detection signals and alerts utilizing the communication means described below.

The following remote computer components manage the main elements of the remote computer service, but this only exemplary and is not so limited. Several of the component defined and described can be replaces by a newly design operation (s), combine operations, or eliminate some operation(s). Professional companies, such as Amazon Web Services, handle most if not all of, the OSS and BSS services, database access, connectivity and database maintenance (e.g. SQL databases like MySQL™, MariaSQL™, and Aurora™, Redshift™, and non-SQL databases like Dynamodb™), server component access and maintenance and load balancing, all for a cost base on various factors. Data access by cell phones, mobile phones, and other electronic apparatus **400**, and remote computers can access the commercial database using certain protocols.

There are large cloud-computing companies with several computer server farms around the world that supplant the independent comprehensive internet infrastructure and communication network. Companies like Amazon®, Microsoft®, Oracle® and Google® have all built a significant quantity of computing infrastructure. Their data centers are vastly bigger, and significantly more efficient, than those operated by or could be built by most other independent companies. The cloud-computing companies with their worldwide server farms allow for scalable and redundant data storage capabilities (Redundant Array of Independent Disks or RAID technology). The large cloud-computer companies can temporarily extend or customize the functionality for a client by transferring logic to it that it can execute. Examples of this may include compiled components such as Java applets and client-side scripts such as JavaScript. Complying with these constraints, and thus conforming to the REST architectural style (REST an acronym for REpresentational State Transfer), which will enable any kind of distributed hypermedia system to have desirable emergent properties, such as performance, scalability, simplicity, modifiability, visibility, portability and reliability (RestAPI). These large companies are presently marketing and rented out their computing capacity to developers and companies around the world. The developer or company doesn't have to incur the capital expense associated with designing network connectivity system, employing various Information technology (IT) professionals, purchasing the necessary computers and servers, developing the custom and non-custom software and conducting the significant maintenance procedures.

A programmer/developer or a company simply pays for the cloud-computing services. Using the cloud-computing services provide the developer and company access to fundamentally unlimited computing power marketed by the cloud computing companies without must incur the expenses for developing and maintaining a private or corporate computer infrastructure.

There are various services, divided into certain categories, that are provided by the cloud computing companies. Infrastructure as a Service, or "IaaS," is the most basic layer of cloud computing. It provides customers with virtual servers and database storage and Internet of Things (IoT) sensor communication and access. Platform as a Service, or "PaaS," which is the set of application tools and services that make it easier for developers and IT professionals to build applications without the capital expense of purchasing software for application development. Software as a Service, or SaaS, which refers to applications that run in the cloud like Microsoft's Office 365, Google's G Suite and Salesforce's products for sales and marketing.

The plan for a cloud-computing companies is to make their services indispensable to both independent software developers and small, medium and large companies. Customers might venture into cloud computing with a single software application (APP) but as their businesses grow,

their cloud-computer needs increase and the cloud-computing service companies are expecting that their cloud usage and revenue will increase. Amazons has increased their presence in the cloud industry, by sacrificing short term profits to enhance the customer experience and maximize long-term gain. The more customers a cloud platform provider contracts with, the more servers and serving farms under their control can be developed. And the more servers the cloud-computing companies have, the better they can take advantage of economies of scale and offer customers lower prices for more robust features, including appeal to large enterprises. The efforts to market cloud-computing services supports that the near future of internet infrastructures and communication networks will increasing be controlled and maintained by the large cloud-computing companies.

Specific communication protocols are becoming important to interface between the cloud-computing companies and the company's local or cloud database for computer, cell phone, smart phone and similar apparatus, smart internet TVs, smart central hub listening and speaker devices, and home control systems, access to acquire requested data (e.g. SQL database requests) and perform instructional activities (turn on/off water). Of these protocols, the Representational state transfer or RestAPI (or REST API), SOAP API, Java API or XML API seem to be appropriate.

Once a user sets up a service, an activation application **494** delivers a first display to the user on either a display means of a remote computer, cell phone, smart phone, mobile phone or other electronic apparatus **400**, smart Internet TVs, smart central hub listening and speaker devices, and home control systems, on the water meter and leak detection system **200** and/or on a display means on the remote devices **480**. This pairing technology or other application secure means associates a new user with a purchased or installed remote device and the water meter and leak detection system **10**, **126**, **200**.

Shown in FIG. **15***a* is an illustration of the pressure drop within a typical 3-bedroom household having copper piping wherein there is no leak. The illustration is a plot of the pressure drop over time when the water supply is turned off by a control valve before the major water distribution lines. The graph has a Y axis that shows the pressure reading and an X axis representing the time parameter. FIG. **15***a* shows that when the water is initially turn off on a no leaks system, there may be an initial drop in pressure that is thought to be due to an interaction of the pressure regulator. But as shown in FIG. **15***a* the initial pressure drop levels off and maintains relatively constant pressure over time. Also shown is a calculated regression line shown in linear dashes and provides the calculated variables (e.g. Y=−83.7X+76.9). The regression calculation can be used by the monitoring software to determine the quantitative loss in pressure over time and allow for artificial intelligence software (AI) to determine what type leak is present.

Shown in FIG. **15***b* is an illustration of the pressure drop with a typical 3-bedroom household having copper piping wherein there the leak is approximately 20 ml/min. The illustration is a plot of the pressure drop over time when the water supply is turned off by a control valve before the major water distribution lines. The graph has a Y axis that shows the pressure reading and an X axis representing the time parameter. FIG. **15***b* shows that when the water is initially turn off on the exemplary 20 ml/min leak, there is a continual relatively slow drop in pressure over time where the pressure approaches zero pressure. Also shown is a calculated regression line shown in linear dashes and provides the calculated variables (e.g., 235.4×47.6). The regression calculation can be used by the monitoring software to determine the quantitative loss in pressure over time and allow for artificial intelligence (AI) to determine what type of leak is present.

FIG. **15***c* is an illustration of the pressure drop with a typical 3-bedroom household having copper piping wherein there the leak is approximately 60 ml/min. The illustration is a plot of the pressure drop over time when the water supply is turned off by a control valve before the major water distribution lines. The graph has an Y axis that shows the pressure reading and a X axis representing the time parameter. FIG. **15***c* shows that when the water is initially turn off on the exemplary 60 ml/min leak, there is a continual relatively fast drop in pressure overtime where the pressure approaches zero pressure. Also shown is a calculated regression line shown in linear dashes and provides the calculated variables Y=−261.6×43.5). The regression calculation can be used by the monitoring software to determine the quantitative loss in pressure over time and allow for artificial intelligence (AI) to determine what type of leak is present.

A number of applications provided by the large cloud-computing companies ensure overall management of the computer infrastructure and network service. These predefined applications are configured to offer off-the-shelf programs and operating systems solutions management of the integrated cloud-computing system service, overall service monitoring, customer support, and reporting.

While this invention has been described as having a preferred design, the present invention can be further modified within the spirit and scope of this disclosure. The application is therefore intended to cover any variations, uses, or adaptations of the invention using its general principles. Further, this application is intended to cover such departures from the present disclosure that arise from known or customary practice and the art to which this invention pertains, and which fall within the limits of the appended claims.

The invention claimed is:

**1**. A water meter and leak detection system comprising:

a base station having a water control mechanism interposed between a main water supply line and a water supply for a building or structure;

said base station further comprising:

a) electrical circuitry including at least one of a CPU, microprocessor and microcontroller with an integrated memory or separate memory module, and a power source;

b) said base station having one or more low rate sensors designed to monitor at least one of a water use data, water energy use data, water quality data, and leak detection information from said building or structure, said one or more flow rate sensors connected to the main water supply and connected with said electrical circuitry;

c) the power source is at least one of an AC powered, DC powered, and one or more standard or rechargeable batteries, said rechargeable batteries capable of being supplemented with a turbine or other rotational mechanism that generates electrical energy, said power source is electrically connected to said electrical circuitry;

d) the CPU, microprocessor, or microcontroller with the electrical circuitry that is monitoring at least one of a water use data, water energy use data, water quality data, and detecting leak conditions is further capable of transmitting a water flow event data using one or more wireless communication technologies;

e) wherein the CPU, microprocessor, or microcontroller can include software that selects a device calibration mode or an automatic learning mode, wherein the device calibration mode utilizes activation of the water use devices, appliances and fixtures and monitors the water flow event at specific intervals, wherein the automatic learning mode utilizes a period of self-learning of the water flow events of water use devices, appliances and fixtures;

f) the one or more wireless communication technologies comprising at least one of a Wi-Fi, LoRa, Sigfox, Ultra Narrow Band, 6LowPAN, NB-IoT, LTE-M cellular, and 5G cellular technology;

wherein when the CPU, microprocessor, or microcontroller with one or more flow rate sensors detects the initiation of water flow, the CPU, microprocessor or microcontroller instructs the water sensor to increase the sampling rate at a sufficient frequency capable to monitor at least one or more water flow rates, one or more water use durations and one or more total volume of water uses until water flow stops defining a water flow event;

an acoustic sensor that monitors vibration frequencies from water use device control valves and assist in at least one of identifying the particular water control valves fixtures or appliances and monitoring for water leaks, and

the base station can either use the water flow event data to locally process, or transfer to a remote computer, the method of utilizing software instructions, algorithms, and artificial intelligence technology for at least one of analyzing water signatures and patterns for identifying water devices, fixtures, and appliances and for providing analytical detection of leak conditions.

**2**. The water meter and leak detection system as recited in claim **1**, wherein said one or more wireless communication technologies interface with remote computers or servers utilizing an application programming interface (REST-API or SOAP-API) technology.

**3**. The water meter and leak detection system as recited in Claim 1 wherein said one or more standard or rechargeable batteries comprises standard or rechargeable lithium batteries, $LiSOCl_2$ bobbin or serial batteries, lithium metal, lithium-air, solid state lithium, lithium sulfur, sodium-ion or $LiSOCl_2$ bobbin with hybrid super capacitor.

**4**. The water meter and leak detection system as recited in claim **1**, further comprises one or more other electronic communication devices that can communicate with the base station that includes at least one of a smart cell phone, mobile phone, PDA, tablet, computer, smart or internet capable television, wireless smartwatch and other electronic communication apparatuses with Wi-Fi and wireless capability.

**5**. The water meter and leak detection system as recited in claim **1**, further including at least one of a mesh and peer-to-peer technology circuitry that can communicate with at least one of other water meter base stations.

**6**. The water meter and leak detection system as recited in claim **1**, transmitting at least one of a water use data, water energy use, water quality data, and leak detection information initiated by a command signal from said smart phone, computer, server, tablet, web portal, or other electronic communication technology devices.

**7**. The water meter and leak detection system as recited in claim **1**, wherein the leak information can provide the registered owners and users a warning or signal on at least one of said smart phone, computer, server, web portal, and other electronic communication devices when a leak condition is observed, wherein said registered owners and users can be provided a number of corrective selections that comprise at least one of the ability to remotely turn off the main water system and contact an individual by phone call, text, or email for initiating corrective actions.

**8**. The water meter and leak detection system as recited in claim **1**, further comprising a temperature sensor in close proximity to said water supply, said temperature sensor can communicate with said water meter and leak detection system and initiate water freezing protection procedures when the water supply line approaches the water freezing point of 32 degrees Fahrenheit or 0 degrees Celsius, such freezing procedures can include at least one of incorporating a freeze plug mechanism, draining the distribution lines with a three way valve, replacing the water in the water line with air, nitrogen or other gas or liquid having a low freezing point.

**9**. The water meter and leak detection system as recited in claim **8**, wherein said water meter and leak detection system, can send a freezing warning message on at least one of said smart phone, computer, server, tablet, web portal, or other electronic communication devices when said freezing condition exists.

**10**. The water meter and leak detection system as recited in claim **1**, utilizing programming instructions to turn off the control valve and water supply during a vacation schedule or work schedule using a software program application associated with at least one of said smart phone, computer, server, tablet, web portal, or other electronic communication devices.

**11**. The water meter and leak detection system as recited in claim **1**, further comprising at least one of a pressure sensor and an acoustic sensor wherein said at least one of a pressure sensor and an acoustic sensor supplies data for software instructions and artificial intelligence algorithms for detecting water patterns and signatures of fixtures and appliances and conditions.

**12**. A water meter and leak detection system as recited in claim **11**, wherein said pressure sensor is capable of quantifying a leak condition when the water meter closes the water control valve mechanism and monitors any pressure changes and is capable of transferring pressure monitoring data information to the base station for making one or more software calculations to determine the leak type or leak category.

**13**. The water meter and leak detection system as recited in claim **1**, further comprising a wired communication technology comprising at least one of an X10, UPE, and HART technology.

**14**. The water meter and leak detection system as recited in claim **1**, is capable of including a second wireless technology comprising at least one of a Bluetooth, and Wi-Fi wireless technology that is capable of performing an authentication pairing procedure for initially establishing remote wireless communications by inputting a network user name and a password, scan a QR code, or perform a two-step authentication scheme.

**15**. The water meter and leak detection system as recited in claim **1**, wherein when said monitoring indicates a leak condition, a message or signal is sent to at least one of a smart phone, computer, server, tablet, web portal, and other electronic communication devices allowing the user to turn off the water control valve mechanism or to program the water meter and leak detection system to automatically turn off the water control valve mechanism.

16. The water meter and leak detection system as recited in claim 1, further comprising a programming setting managed by the user, remotely a mode setting, and a default or restricted setting processed by the manufacturing factory to:

a) record the water flow event to a local memory bank or removable memory device for regional or controlled analysis.

b) combine a plurality of water flow events into a local memory bank and subsequently schedule the transfer of the water flow event dataset to a remote computer or server, or to a cloud service company.

c) directly transfer the water flow event to a remote computer or server, or to a cloud service company, or

d) transfer the water flow data utilizing a blockchain format to one or more remote computers or servers, or cloud service company.

17. A water meter and leak detection system as recited in claim 1 further comprising an acoustic sensor that monitors vibration frequencies from water use device control valves and identifying the particular water control valves fixtures or appliances while monitoring for water leaks.

18. A water meter and leak detection system as recited in claim 1, wherein an owner or user can communicate with at least one of a smart phone, computer, server, tablet, web portal and one or more other electronic communication devices that includes a software program application capable of displaying an icon, menu, or submenu at least one function of:

(d) providing a graphical display of at least one of water use history, water energy usage history, and water quality history from a selected water fixture or water appliance, said history transferred from at least one of said base station, said remote central computer and the cloud service provider or web-based computer;

(e) displaying an alarm condition based on one of said water use history, water energy usage history, or water quality history programmed into said base station;

(f) turning on, or off the water supply by sending a command signal transferred to the base station;

(e) showing or modifying a program, setting, or a default menu incorporated within the base station;

(h) Specifying the water control valve mechanism operational position by sending a request to the base station;

(i) downloading updates or regional water rates into the base station; and

(j) programming a vacation or work water schedule into the base station.

19. A water meter and leak detection system as recited in claim 1, further comprising that the one or more wireless communication technologies capable of transferring to the internet water use data, water energy use data, water quality data, detecting leak conditions, and sending a control signal utilizing block chain technology.

20. A water meter and leak detection system as recited in claim 1, further comprising wherein the CPU, microprocessor, or microcontroller with the electrical circuitry including one or more wireless communication technologies can enter into one or more sleep modes when not transmitting water data, not detection a water leak condition receiving commands or instructions or are between water flow events.

21. A water meter and leak detection system as recited in claim 1, further comprising the base station can either 1) recording to least one of a memory bank, removable memory bank, and local network at least one of a water flow water event, transmitting water data, detecting a water leak condition, and receiving a command or instruction, or 2) can transmit at least one of a water flow water event, transmit water data, detect water leak condition, and receiving a command or instruction utilizing at least one of an internet connection, a private network system, and a corporate owned network system that communicates with at least one of a remote computer or server, a commercial cloud-service company, and a web-based computer company.

22. A water meter and leak detection system comprising:

a collection node having a water control mechanism interposed between a main water supply line and a water supply for a building or structure;

said collection node further comprising:

a) a first electrical circuitry including at least one of a first CPU, microprocessor, and microcontroller with a first integrated memory or separate memory module, and a first power source;

b) said collection node having one or more flow rate sensors designed to monitor at least one of a water use data, water energy use data, water quality data and leak detection information from said building or structure, said one or more flow rate sensors connected to the main water supply and connected with said first electrical circuitry;

c) the first power source is at least one of an AC powered, DC powered, and one or more standard or rechargeable batteries, said rechargeable batteries capable of being supplemented with a turbine or other rotational mechanism that generates electrical energy, said power source is electrically connected to said electrical circuitry;

d) the at least one of a first CPU, microprocessor, or microcontrollers that is monitoring at least one of a water use data, water energy use data, water quality data, and detecting leak conditions is further capable of transmitting a water flow event data using one or more first wireless communication technologies;

e) one or more first wireless communication technologies comprising at least one of LoRa, Sigfox, WiMAX, Ultra Narrow Band, 6LowPAN, NB-IoT, LTE-M cellular, and 5G cellular technology; and

f) wherein said one or more first wireless communication technologies utilizes authentication and encryption technologies for pairing operations and to prevent unauthorized access to the water use data or information;

wherein when the CPU, microprocessor, or microcontroller with one or more flow rate sensors detects the initiation of water flow, the CPU, microprocessor or microcontroller instructs the water sensor to increase the sampling rate at a sufficient frequency capable to monitor at least one or more water flow rates, one or more water use durations and one or more total volume of water uses until water flow stops defining a water flow event;

wherein the first CPU, microprocessor, or microcontroller transfers the water flow event by wired, or wireless communication technology to one or more remote communication hubs;

wherein the one or more communication hubs having one or more wireless communication technology that corresponds to the one or more first wireless communication technology, wherein the one or more communication hubs function to extend the range of wireless technology;

the one or more communication hubs having a second electrical circuitry including at least one of a second

CPU, microprocessor, and microcontroller, a second integrated memory or separate memory module, and a second power source;

wherein the electrical circuitry has programmed instructions processing the water flow data from the long-range first wireless radio into a second wireless radio that communicates with at least one of a wireless router, or another RF technology or cellular radio that communicates with a private or public corporate network;

the one or more communication hubs can have at least one of Wi-Fi wireless technology or radio that communicates with a wireless router connected to the internet or network system and a wired connection that communicates with a router, internet or network connection;

the second CPU, microprocessor or microcontroller can at least include one of a programming setting managed by the user, remotely a mode setting, and a default or restricted setting processed by the manufacturing factory to:

a) record the water flow event to a local memory bank or removable device for regional or controlled analysis,

b) combine a plurality of water flow events into a local memory bank and subsequently schedule the transfer of the water flow event dataset to a remote computer or server, to a cloud service company,

c) directly transfer the water flow event to a remote computer or server, or to a cloud service company, or

d) transfer the water flow data utilizing a blockchain format to one or more remote computers or servers, or cloud service company, and

the communication hub can either use the water flow event to locally process, or transfer to a remote computer, the method of utilizing software instructions, algorithms, and artificial intelligence technology for analyzing water signatures and patterns for identifying water devices, fixtures, and appliances and for providing analytical detection of leak conditions.

**23**. The water meter and leak detection system as recited in claim **22**, wherein said one or more wireless communication technologies interface with remote computers or servers utilizing an application programming interface (REST-API or SOAP-API) technology.

**24**. The water meter and leak detection system as recited in claim **22**, wherein said one or more standard or rechargeable batteries comprises standard or rechargeable lithium batteries, $LiSOCl_2$ bobbin or serial batteries, lithium metal, lithium-air, solid state lithium, lithium sulfur, sodium-ion or $LiSOCl_2$ bobbin with hybrid super capacitor.

**25**. The water meter and leak detection system as recited in claim **22**, wherein the other electronic communication devices include at least one of a PDA, tablet, computer, a smart or internet capable television, wireless smartwatch, and other electronic apparatuses with Wi-Fi and wireless capability.

**26**. The water meter and leak detection system as recited in claim **22**, further including at least one of a mesh and peer-to-peer technology circuitry that can communicate with at least one of another water meter collection nodes and communication hubs.

**27**. The water meter and leak detection system as recited in claim **22**, transmitting at least one of a water use data, water energy use data, water quality data, and leak detection information initiated by a command signal from at least one of said smart phone, computer, server, tablet, web portal, and other electronic communication technology devices.

**28**. The water meter and leak detection system as recited in claim **22**, wherein the collection node or communication hub can locally store data, or said remote computers can store data such that water use, water energy use, and/or water quality recorded on at least of one of an hourly, daily, weekly, monthly and yearly basis that is available for review for specified individuals or agencies.

**29**. The water meter and leak detection system as recited in claim **22**, wherein the leak information can provide the registered owners and users a warning or signal on at least one of a smart phone, computer, server, tablet, web portal, and other electronic communication devices when a leak condition is observed, wherein said registered owners and users can be provided a number of corrective selections that comprise at least one of the ability to remotely turn off the main water system and contact an individual by phone call, text, or email for initiating corrective actions.

**30**. The water meter and leak detection system as recited in claim **22**, further comprising a temperature sensor in close proximity to said water supply, said temperature sensor can communicate with said water meter and leak detection system and initiate water freezing protection procedures when the water supply line approaches the water freezing point of 32 degrees Fahrenheit or 0 degrees Celsius, such freezing procedures can include at least one of incorporating a freeze plug mechanism, draining the distribution lines with a three way valve, replacing the water in the water line with air, nitrogen or other gas or liquid having a low freezing point.

**31**. The water meter and leak detection system as recited in claim **30**, wherein said water meter and leak detection system, can send a freezing warning message on at least one of a smart phone, computer, server, table, web portal, and other electronic communication devices when said freezing condition exists.

**32**. The water meter and leak detection system as recited in claim **22**, utilizing programming instructions to turn off the water control valve mechanism and water supply during a vacation schedule or work schedule using a software program application associated with at least one of a smart phone, computer, server, tablet, web portal, and other electronic communication devices.

**33**. The water meter and leak detection system as recited in claim **22**, further comprising at least one of a pressure sensor and an acoustic sensor wherein said at least one of a pressure sensor and an acoustic sensor supplies data for software instructions and artificial intelligence algorithms for detecting water patterns and signatures of fixtures and appliances and leak conditions.

**34**. A water meter and leak detection system as recited in claim **33**, wherein said pressure sensor is capable of quantifying a leak condition when the water meter closes the water control valve mechanism and monitors any pressure changes and is capable of transferring pressure monitoring information to the base station for making one or more software calculations to determine the leak type or leak category.

**35**. The water meter and leak detection system as recited in claim **22**, is capable have a further comprising second wireless communication technology utilizing at least of one of a Bluetooth, Bluetooth low energy, Zigbee, Z-wave and Wi-Fi wireless technology for performing an authentication pairing procedure to initially establishing remote wireless communications by inputting a network user name and a password, scan a QR code or perform a two-step authentication scheme.

36. The water meter and leak detection system as recited in claim 22, wherein when said monitoring indicates a leak condition, a message or signal is sent to at least one of a smart phone, computer, server, tablet, web portal, and other electronic communication device allowing the user to turn off the water control valve mechanism or program the water meter and leak detection system to automatically turn off the water control valve mechanism.

37. A water meter and leak detection system as recited in claim 22, further comprising a wired communication technologies comprising at least one of a X10, UPB, and HART technologies.

38. A water meter and leak detection system as recited in claim 22, wherein owner or user can communicate with at least one of a smart phone, computer, server, tablet, web portal and one or more other electronic communication devices that includes a software program application capable of displaying an icon, menu, or submenu at least one function of:

(g) providing a graphical display of at least one of water use history, water energy usage history, and water quality history from a selected water fixture or water appliance, said history transferred from at least one of said base station, said remote central computer and the cloud service provider or web-based computer;

(h) displaying an alarm condition based on one of said water use history, water energy usage history, or water quality history programmed into said base station;

(i) turning on or off the water supply by sending a command signal transferred to the base station;

(f) showing or modifying a program, setting, or a default menu incorporated within the base station;

(k) Specifying the water control, valve mechanism operational position by sending a request to the base station;

(1) downloading updates or regional water rates into the base station; and

(m) programming a vacation or work water schedule into the base station.

39. A water meter and leak detection system as recited in claim 22, further comprising that the one or more wireless communication technologies capable of transferring to the internet water use data, water energy use data, water quality data, detecting leak conditions, and sending a control signal utilizing block chain technology.

40. A water meter and leak detection system as recited in claim 22, further comprising wherein the first CPU, microprocessor, or microcontroller with the first electrical circuitry including one or more first wireless communication technologies can enter into one or more sleep modes when not transmitting water data, not detection a water leak condition, receiving commands or instructions or are between water flow events.

41. A water meter and leak detection system as recited in claim 22, further comprising that the one or more communication hubs can at least one of a 1) recording to least one of a memory bank, removable memory bank, and local network at least one of a water flow water event, transmitting water data, detecting a water leak condition, and receiving a command or instruction, or 2) can transmit at least one of a water flow water event, transmit water data, detect water leak condition and receiving a command or instruction utilizing at least one of an internet connection, a private network system, and a corporate owned network system that communicates with at least one of a remote computer or server, a commercial cloud-service company, and a web-based computer company.

42. A water meter and leak detection system comprising:

a base station having a water control mechanism interposed between a main water supply line and a water supply for a building or structure;

said base station further comprising,

a) electrical circuitry including at least one of a CPU, microprocessor and microcontroller with a power source;

b) one or more flow rate sensor connected to the main water supply and connected to said electrical circuitry and designed to monitor at least one of a water use data, water energy use data, water quality data and leak detection information from said building or structure, said one or more flow rate sensors connected to the main water supply and connected with said electrical circuitry;

c) said power source that is at least one of an AC powered, DC powered, and one or more standard or rechargeable batteries, said rechargeable batteries capable of being supplemented with a turbine or other rotational mechanism that generates electrical energy said power source is electrically connected to said electrical circuitry;

d) one or more wireless communication technologies comprising at least one of a LoRa, Sigfox, Ultra Narrow Band 6LowPAN, NB-IoT, LTE-M cellular, and 5G cellular technology;

e) wherein said one or more wireless communication technologies utilizes authentication and encryption technologies for pairing operations and to prevent unauthorized access to the water data or information; and

f) wherein the long-range LoRa, Sigfox, UNB, NB-IoT, 6LoWPAN, WiMAX, cellular technology 3GPP and LTE-M and 5G consist of a duplex technology to both receive at least one of a water use data, water energy use data, water quality data and leak detection information and send commands to regulate the control valve mechanism

the CPU, microprocessor or microcontroller can at least include one of a programming setting managed by the user, remotely a mode setting, and a default or restricted setting processed by the manufacturing factory to:

a) record the water flow event to a local memory bank or removable memory device for regional or controlled analysis,

b) combine a plurality of water low events into a local memory bank and subsequently schedule the transfer of the water flow event dataset to a remote computer or server, or to a cloud service company,

c) directly transfer the water .flow event to a remote computer or server, or to a cloud service company, or

d) transfer the water flow data utilizing a blockchain format to one or more remote computers or servers, or cloud service company; and

the one or more wireless communication technologies capable of transmitting at least one of a 1) water use data, water energy use data, water quality data and leak detection information and, 2) obtains an instruction or signal to command the management of the water control valve or perform a command operation, using at least one of an Internet connection, a private network system, and a corporate owned network system, and a smart phone, computer, server, tablet, web portal, and other electronic communication device, that communi-

cates with at least one of a remote computer or server, a commercial cloud-company, and a web-based company.

**43**. A water meter and leak detection system as recited in claim **42**, further comprising a temperature sensor in close proximity to said water supply, said temperature sensor can communicate with said water meter and leak detection system and initiate water freezing protection procedures when the water supply line approaches the water freezing point of 32 degrees Fahrenheit or 0 degrees Celsius, such freezing procedures can include at least one of incorporating a freeze plug mechanism, draining the distribution lines with a three way valve, replacing the water in the water line with air, nitrogen or other gas or liquid with low freezing point.

**44**. A water meter and leak detection system as recited in claim **42**, further comprising at least one of a pressure sensor and an acoustic sensor are capable of quantifying a leak condition when the water meter closes the water control valve mechanism and monitors any pressure changes and is capable of transferring pressure monitoring information to the base station for making one or more software calculations to determine the leak type or leak category.

**45**. A water meter and leak detection system as recited in claim **42** further comprising one or more communication hubs is in wired communication with the base station or having a wireless communication technologies corresponding with the one or more wireless communication technologies of the base station that transfers water use data, water energy use data, water quality data or a leak detection condition to at least one of an Internet connection, private network system, and corporate owned network system that communicates with at least one of a remote computer or server, a commercial cloud-company and a web-based company.

**46**. A water meter and leak detection system as recited in claim **42**, is capable have a further comprising second wireless communication technology utilizing at least of one of a Bluetooth, Bluetooth low energy, and Wi-Fi wireless technologies for performing an authentication pairing procedure to initially establishing remote wireless communications by inputting a network username and a password, scan a QR code or perform a two-step authentication scheme.

**47**. A water meter and leak detection system as recited in claim **42**, wherein an owner or user can communicate with at least one of a smart phone, computer, server, tablet, web portal and one or more other electronic communication devices that includes a software program application capable of displaying an icon, menu, or submenu at least one function of:

(a) providing a graphical display of at least one of water use history, water energy usage history, and water quality history from a selected water fixture or water appliance, said history transferred from at least one of said base station, said remote central computer and the cloud service provider or web-based computer;

(b) displaying an alarm condition based on one of said water use history, water energy usage history, or water quality history programmed into said base station;

(c) turning on or off the water supply by sending a command signal transferred to the base station;

(d) showing or modifying a program, setting, or a default menu incorporated within the base station;

(e) Specifying the water control valve mechanism operational position by sending a request to the base station;

(f) downloading updates or regional water rates into the base station; and

(g) programming a vacation or work water schedule into the base station.

**48**. A water meter and leak detection system as recited in claim **42**, wherein one of collection nodes are capable of including at least one of a mesh and/or and peer-to-peer technology circuitry that can communicate with at least one of another water meter collection nodes and communication hubs.

**49**. A water meter and leak detection system as recited in claim **42**, wherein one of more communication hubs are capable of including at least one of a mesh and/or and peer-to-peer technology circuitry that can communicate with at least one of another water meter collection nodes and communication hubs.

**50**. A water meter and leak detection system as recited in claim **42**, further comprising one or more wired communication technology comprising at least one of a X10, UPB, and HART technology.

**51**. A water meter and leak detection system as recited in claim **42**, further comprising that the one or more wireless communication technologies capable of transferring to the internet water use data, water energy use data, water quality data, detecting leak conditions, and sending a control signal utilizing block chain technology.

* * * * *

# EXHIBIT D

**IN THE UNITED STATES DISTRICT COURT FOR THE DISTRICT OF DELAWARE**

| | |
|---|---|
| **REIN TECH, INC.,**<br>**Plaintiff,**<br>**v.**<br>**MUELLER SYSTEMS, LLC,**<br>**Defendant.** | **No. 1:18-cv-01683-MN** |

# TESTIMONY BY EXPERT WITNESS UNDER FEDERAL EVIDENCE CODE §702

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## I. INTRODUCTION

Plaintiff Rein Tech, Inc. (Rein Tech) respectfully submits this Testimony by Expert Witness pursuant to the *Federal Rule of Evidence 702 Testimony by Expert Witnesses*. Federal Rule of Evidence 702.

## II. STATEMENT OF FACTS

| US. Patent No. | Asserted Claim(s) |
|---|---|
| 11,549,837 | 42, 47, 48, and 49 |

1) Michael E. Klicpera, Esq. is the inventor of U.S. Patent No. 11,549,837 which is being enforced in the current litigation.
2) Patent Application 16/356,870 clearly disclosed and claimed a water meter and network for LoRa and cellular wireless technology. After the USPTO issued U.S. Patent No. 11,549,837 (the "837 Patent") based on Application 16/356,870, the '837 Patent was assigned to Rein Tech. On March 10, 2023, Plaintiff added the '837 Patent to this case by filing a Second Amended Complaint (D.I. 91 at 9-10) against Defendant, whose wireless water meter utilizes LoRa technology. Plaintiff's claim charts submitted with the original Complaint (D.I. 1), the First Amended Complaint (D.I. 81), and the Second Amended Complaint (D.I. 91) demonstrate Defendant's infringement of the '837 Patent. Plaintiff

asserts that Defendant continues to practice the technology disclosed in Rein Tech's Patent-in-Suit.

3) On October 10, 2024, the USPTO granted and published a Certificate of Correction (USPTO downloaded copy provided (*Id.*, Ex. 1)). This Certificate of Correction addressed the Defendant's Invalidity Contention which is the primary defense propounded by the Defendant. Defendant's lawyers never contended that Defendant's water meter did not infringe the '837 Patent. And, as shown below, the Defendant misrepresented the number of units sold to be zero.

4) Expert Witness, Michael Klicpera, Esq., has considerable knowledge, skill, experience, training, and education about the subject matter, has worked extensively with Rein Tech's electronic and software engineers, and has developed and conducted residential field studies.

5) Michael Klicpera, Esq. has drafted over 100 patents and has a specific interest in water conservation and devices. Michael Klicpera, Esq. has twenty patents and patent applications for shower devices, water meter devices, and irrigation devices.

6) Michael Klicpera, Esq. is a Patent Attorney and a licensed California Attorney admitted to the Southern California and Northern California Federal District Courts.

## A. DEFENDANT WITHHELD CRITICAL EVIDENCE DURING DISCOVERY

Plaintiff served Defendant with Interrogatories on June 1, 2023 (D.I. 103), and with a first Request for Production of Documents (1-5) on June 29, 2023.

On July 3, 2023, Defendant responded to Rein Tech's Interrogatories. (*Id.*, Ex. 2; D.I. 112.) Defendant's responses to Interrogatories No. 2, 4, 5, and 8 admitted that Mueller had installed its water meters with wireless technology at four sites (two pilot cellular and two LoRaWAN installations) since 2018. (*Id.*, Ex. 2, No. 2.) Mueller further admitted that its network system (Mi.Net and backend software) includes collectors and/or repeaters (communication hubs), utilizes a LoRa, a cellular or internet connection to an Amazon Web Server (AWS) server, and utilizes a specialized API and the Sentryx™ server. (*Id.*, Ex. 2, Nos. 2, 4, 5, and 8) Defendant's responses did not disclose critical information requested by Plaintiff including the location of the sites, the number of water meters installed, and any profits or revenue. (*Id.*, Ex. 2, Nos. 2 and 19)[1] Their responses failed to identify the individual(s) from Mueller who answered the interrogatory questions, as required under *Federal Rule of Civil Procedure 33.*

[1] Nor did Defendant provide documents in response to Rein Tech's first request for Production of Documents and Mueller completely ignored Rein Tech's second request for Production of Documents.

Defendant withheld basic and critical information requested by Plaintiffs Interrogatories 1 through 25. For example, Rein Tech's Interrogatory No. 2 requested that Defendant "Describe the number of LoRa and Cellular installations for contracted projects with third parties using the accused products since 2018." Defendant responded:

> Mueller objects to this Interrogatory to the extent it seeks information that is protected by the attorney-client privilege and/or by the work product immunity. Based on its objections and understanding of the Interrogatory, Mueller states that since 2018, it has approximately two pilot cellular installations and two LoRaWAN installations. Mueller's response to this Interrogatory is made based on present knowledge, and its investigation and review of documents is ongoing. Mueller reserves the right to supplement and/or change its response as discovery and the case progress. (*Id.*, Ex. 8, No. 2)

Rein Tech's Interrogatory No. 19 requested a description of Mueller's historical market share, sales volume, pricing, revenues, costs, profits, profit margins, and cash flow relating to the accused products. However, Mueller did not provide the requested information and responded as shown below.

> Mueller objects to this Interrogatory to the extent it seeks information that is protected by the attorney-client privilege and/or by the work product immunity. Mueller further objects to this Interrogatory as overly broad and unduly burdensome as it seeks information not relevant to the subject matter involved in this litigation nor proportional to the needs of the case. Subject to and without waiving its objections, Mueller responds as follows:
>
> Mueller has not yet completed its investigation and review of documents regarding this Interrogatory. Based on its objections and understanding of the Interrogatory, Mueller will identify relevant documents for the accused products, if such documents exist, and reserves the right to produce documents pursuant to Rule 33(d).

> Mueller also reserves the right to supplement and/or change its response to this Interrogatory as discovery and the case progress.

Mueller stated that they "reserve the right to supplement and/or change its response as discovery and the case progress" or "object[s] to this Interrogatory to the extent it seeks information that is work product immunity". However, Mueller neither provided supplemental responses nor documents supporting disclosures in Defendant's response to Plaintiff's Interrogatories.

The Defendant did not provide relevant, responsive documents in response to Plaintiff's first Request for Production of Documents (1-5), submitted to Defendant on May 31, 2023 (*see* D.I. 102). Defendant's response, dated June 29, 2023, objected to all requests and produced no documents. (*Id.* Ex. 3) Subsequently, Mueller's attorney sent an email on July 31, 2023 (Ex. 4) to Rein Tech's previous counsel stating:

> "Based on our investigation, which is ongoing, it is our understanding at present that none of Mueller's LoRaWAN and Cellular Node installations to date involve combinations with 420 RDMs and, as such, quarterly and annual gross and net sales in U.S. dollars and quantities sold in and from the United States for the accused products from October 27, 2021, to present: as requested in Document Request No. 2. is $0 for all requested categories, with no responsive documents to produce." (*Id.*, Ex. 4.)

Rein Tech's previous counsel was extremely dissatisfied with Mueller's failure to produce any documents and responded to Mueller's July 31, 2023, email (and the "spreadsheet compiling associated financial

information" provided via Mueller's ShareFile link). In an email dated September 10, 2023, Rein Tech's previous counsel informed Mueller's attorney that:

> Further regarding your email below from July 31, you say that to date Mueller hasn't sold and/or installed any 420 RDMs with a LoRaWAN or Cellular Nodes, so that Mueller's sales of these components is $0. This makes no sense. Rein Tech has provided exhibits in its first and second amended complaint and its initial and final infringement contentions showing the 420 RDM is designed to be packaged with either a LoRaWAN or Cellular Node. The 420 RDM is useless without one of these nodes. It cannot communicate with Mueller's Mi.Net network and Sentryx servers without them. Rein Tech's initial and final infringement contentions make this clear. Mueller's answers to interrogatories nos. 4, 5, and 8 also make this clear. *(emphasis added)* (*Id.,* Ex. 4.)

Defendant's email response regarding Plaintiff's first Request for Production of Documents (*Id.*, Ex. 2) referred only to the 420 RDM water meter with a LoRaWAN or Cellular node and denied any installation or sale of the accused products. (*Id.*, Ex. 2) This response contradicted their previous responses to Interrogatories No. 2, 4, 5, and 8 where Mueller admitted to two LoRa and two cellular water meter installation sites, with communication hubs (collectors and/or repeaters) that use a cellular or internet connection to an AWS server utilizing a specialized API (Sentryx™). (Id., Ex. 2) In addition, Mueller's installation of four sites for wireless water meters would certainly generate sales. The furnishing of such sales information was elicited specifically and required by the first Request

for Production of Documents No. 2. (*Id.*, Ex. 5) Yet Defendant produced no documents.

On September 10, 2023, Plaintiff served Defendant with the more detailed second Request for Production of Documents (6-15) (*Id.*, Ex. 6), which was due on October 10, 2023. (*Id.*, Ex. 6) Rein Tech's previous counsel also sent an email with an attached letter, dated September 14, 2023, to Mueller's attorney (*Id.*, Ex. 7) and presented Defendant with twenty-three discovery deficiencies. (*Id.*, Ex. 7)[2] Defendant never responded to the second Request for Production of Documents nor to the letter by Plaintiff's previous counsel.

Instead, Defendant completely ignored the second Request for Production of Documents and, within two weeks after the due date for their response, initiated settlement negotiations and offered an unacceptable Settlement Agreement.

## B. PLAINTIFF'S OWN DISCOVERY YIELDED FINDINGS THAT CONTRADICT DEFENDANT'S FAILURE TO RESPOND TO THE PRODUCTION OF DOCUMENTS AND EMAIL COMMUNICATIONS

[2] In contrast, Plaintiff responded to Defendant's Interrogatories and Request for Production of Documents, providing emails from Rein Tech's engineering team; engineering drawings; disclosure book pages, and other relevant documentation; and actual water meter test products used in the residential field study including communications hubs. (*See* D.I. 114)

Upon viewing Mueller's own website, Rein Tech became aware that Defendant installed wireless water meters at the following sites: Florence, Arizona; San Diego, California; Fort Myers/Lee County, Florida; and Sheridan, Wyoming.

Because of Defendant's deficient discovery responses, Rein Tech retained a Research Attorney who conducted an independent investigation of public and governmental sources that, to date, has identified at least five additional sites where Defendant installed wireless water meters during the time the '837 Patent has been enforceable. The five independently identified sites are: Newport Beach, California. (*Id.*, Ex. 8.1-8.3), Northwest Florida/Santa Rosa County, Florida (*Id.,* Ex. 9.1-9.4); Calaveras County, California (*Id.*, Ex. 10); South Daytona, Florida (*Id.*, Ex. 11); and West Slope, Oregon (*Id.,* Ex. 12.1-12.2). Furthermore, Mueller may have manufactured the Mueller 420 RDM in the United States and deployed or sold water meters in operation in the international market.

Plaintiff's independent investigation was limited to publicly available sources, and the relevant publicly available information that was discovered solely by the efforts of Plaintiff may be limited and incomplete. Rein Tech's knowledge gained through its own investigation does not excuse Defendant's discovery deficiencies. Pursuant to Plaintiff's independent investigation, Rein Tech discovered specific sites where Mueller's 420

RDM (or equivalent) water meters have been installed and are in operation. Thus, Defendant's negative responses demonstrate that Mueller withheld critical evidence in responding to Rein Tech's discovery requests.

The Research Attorney found publicly available evidence that Mueller installed wireless water meters in **Newport Beach, California (Exhibit 8).**

> **Document 1 (Exhibit 8.1)** *Water Online* news article, source: Mueller Water Products, Mueller Awarded Contract for AMI Development in Newport Beach, CA, October 21, 2020. Statement: "The Mi.Net AMI system uses a LoRa-enabled radio device that is attached to the newly installed meter and digital register to transmit water usage information over a secure network. The new system will leverage the Sentryx™ water intelligence software platform which is easy to use and gives water utilities access to accurate water usage information, near real-time alerts and provides data to the City's water billing system. The City will also have the capability to provide hourly water usage information to customers."

> **Document 2 (Exhibit 8.2)** City of Newport Beach, City Council Staff Report, Advanced (Water) Meter Infrastructure Project, Approval of Initial Proof of Performance Purchase and Installation Agreement, Project 19W12, January 22, 2019. Statement: "The Utilities and Finance Departments recommend that the City move forward with an Advanced Meter Infrastructure (AMI) Project on its water meters. The proposed AMI project would install new "smart meters" which will provide automation and improved customer service and response. The departments have procured Mueller LLC as the preferred vendor through an RFP process and now recommend approval of the initial "Proof of Performance" phase of project." **[page 15-2, PDF page 2]:** Mueller Systems, LLC ranked number 1 with an overall score of 87.58 by the evaluation panel in the Request for Proposal process; **[pages 15-21, PDF page 21]:** 4.1 Network Equipment; 4.2 Meter and MiNode**;** 5. AMI Software Integration- Mi Host 6. AMI Software

Integration- Consumer Portal; **[pages 15-24 to 15-35, PDF pages 24-35]:** 4.1 Network Equipment; 4.2 Meter and MiNode; **[page 15-36, PDF page 36]:** 5. AMI Software Integration- Mi Host; **[page 15-36, page, PDF page 36]:** 6. AMI Software Integration- Consumer Portal; **[page 15-42, PDF page 42]:** XR-R Mi.Hub Collector (on Radio Tower), XR Mi.HUB (on lift station and street lights), AC XR Repeaters (on Street Lights); **[page 15-61, PDF page 61]:** Consumer Portal Integration Plan, Mueller Mi.Hosts => Newport Beach Consumer Portal Interface; **[page 15-65, PDF page 65]:** 1. All Mi.Nodes and meters physically installed, 2. Network infrastructure installed, 3. All Nodes have been configured for reporting.

**Document 3 (Exhibit 8.3)** AMENDMENT NO. ONE TO PURCHASE, INSTALLATION, AND MAINTENANCE AGREEMENT WITH MUELLER SYSTEMS, LLC FOR AUTOMATED METER INFRASTRUCTURE FOR CITY WATER METERS. Information **[PDF page 1]:** On May 25, 2023, the City of Newport Beach awarded to Mueller Systems, LLC an agreement to furnish, install, and maintain an Automated Meter Infrastructure (AMI) solution as detailed in the Scope of Work of Exhibit A of the Agreement, consisting of approximately twenty-six thousand six-hundred and eighty (26,680) Mueller wireless water meters for a sum of eight-million one-hundred and fifty thousand dollars ($8,150,000); **[PDF page 5]:** Contractor's compensation for all Work performed in accordance with this Agreement, including all reimbursable items, subcontractor fees, for a base contract amount of Seven Million Eight Hundred Thirty Seven Thousand One Hundred Seventy Three Dollars and 14/100 ($7,837,173.14), and 2% allocation for bonding in the amount of One Hundred Fifty Six Thousand Seven Hundred Forty Three Dollars and 46/100 ($156,743.46), and a 2% contingency in the amount of One Hundred Fifty Six Thousand Eighty Three Dollars and 40/100 ($156,083.40), which shall not exceed **Eight Million One Hundred Fifty Thousand Dollars and 00/100 ($8,150,000.00)**; **[PDF page 20]:** 4.1. Network Equipment, 4.2. Meter and MiNode, 5. AMI Software Integration - Mi.Host, 6. AMI Software Integration - Consumer Portal **[PDF page 22]:** Basic AMI • Utility User Interface,

• List of Installed meters with last uploaded reading, • Deployment wide consumption graph, • Meter Details page for each meter, • Basic Graphing of Consumer Consumption, • Customer Information (Automatically Imported as Read only), • Account Management (Read only - imported from existing billing system), • Hourly readings on all meters; **[PDF page 23]:** 4.1. Network Equipment A preliminary network design has been completed based on the inputs provided to Mueller Systems and is attached as Attachment 1. Mueller Systems will conduct final site surveys and develop a Final Network Design following contract execution. Both parties will review network design inclusive of locations, assumptions, etc. prior to installation of network equipment. If any City assets are needed, City approvals will be requested, and the design adjusted accordingly. Mueller Systems will request City approval of the Final Network Design if any City assets are required for coverage. Mueller Systems will complete the installation of all required Collectors and ancillary equipment no later than 90 days from Effective Date for locations where Data Collectors have been sited. Descriptions of the proposed sites, equipment, and placements are in the Propagation Study are in Attachment 1. The installed network will be tested for coverage as part of the Project 4.2. Meter and MiNode Meters and MiNode equipment will be installed by Mueller Systems subcontractor, and will be managed by the Mueller Systems project team. Mueller Systems will provide training for installation teams on the use of MiNet specific installation tools and procedures; **[PDF pages 34-64]:** 5. AMI Software Integration - Mi.Host, 6. AMI Software Integration - Consumer Portal with Smart Energy Water, 7. Mueller Systems' Responsibilities, Coordinate Project Communications and Status Updates, • Install Mi.Net Infrastructure. • Provide Mi.Host Server Hosting - Mueller Systems will host the server for Mi.Net AMI server. • Mi.Node installations will be completed by Mueller Systems subcontractor. **[PDF page 65]:** Models 400 and 500 Series Meters, Solid State Meters; **[PDF page 78]:** RLI Insurance Company duly authorized to transact business under the laws of the State of California, as Surety (referred to as "Surety") are held and bound unto the City of Newport Beach, in the sum of Eight Million One Hundred Fifty Thousand Dollars and

00/100 ($8,150,000.00); **[PDF page 83]:** RLI Insurance Company duly authorized to transact business under the laws of the State of California, as Surety (referred to as "Surety") are held and bound unto the City of Newport Beach, in the sum of Eight Million One Hundred Fifty Thousand Dollars and 00/100 ($8,150,000.00).

**Mueller did not disclose the installation, use, or profit/revenue associated with their wireless water meters in Newport Beach, California, in response to Rein Tech's Request for Production of Documents and Interrogatories.**

The Research Attorney found publicly available evidence that Mueller installed wireless water meters in **Northwest Florida/Santa Rosa County, Florida (Exhibit 9)**.

**Document 1 (Exhibit 9.1)** *Water Online* news article, Pace Water System Improves Management Of Its Water Infrastructure With Mueller Systems' AMI Network, April 27, 2017. Statement: "Mueller Systems' AMI system and remote disconnect meters are proving to be tremendous assets in helping us manage our water system more efficiently and better serve our customers … Pace Water System is also installing more than 1,000 of Mueller Systems' 420 Remote Disconnect Meters (RDMs), which enable the utility to manage water service remotely rather than at the point of service. The two-way Mi.Net AMI system connects meters, leak detection sensors and control devices into an efficient wireless network. With Mueller Systems' advanced RDMs, Pace Water Systems can reduce the number of utility truck rolls and enhance customer service for the large population of seasonal residence in the utility's northwest Florida service area."

**Document 2 (Exhibit 9.2)** *Water Finance and Management* article, Florida water system, Mueller to launch meter customer service pilot program, March 28, 2022. Statement: "Mueller Systems has been selected by Pace Water System in Santa Rosa County, Florida, to

deploy a pilot program for their water meter system which includes new features that allow customers to control their meter from a mobile phone. The pilot program is underway and is expected to include 350 customers, with completion of the program at the end of this month."

**Document 3 (Exhibit 9.3)** Mueller *Innovation News,* Mueller Deploys Smart Customer IoT Product in Santa Rosa County, Florida, March 2022, (http://marketing.muellerwp.com/mueller-innovation-news-march-2022). Statement: "Mueller Systems has been selected by Pace Water System in Santa Rosa County, Florida to deploy a pilot program for their water meter system which include new features that allow customers to control their meter from a mobile phone. The pilot program is underway and is expected to include 350 customers, with completion of the program at the end of this month."

**Document 4 (Exhibit 9.4)** *Water Online* news article: Mueller Deploys Smart Customer IoT Product In Santa Rosa County, FL, March 25, 2022. Statements: "Mueller Systems has been selected by Pace Water System in Santa Rosa County, Florida, to deploy a pilot program for their water meter system which includes new features that allow customers to control their meter from a mobile phone. The pilot program is underway and is expected to include 350 customers, with completion of the program at the end of this month. …The integration uses Mueller's Sentryx API (Application Programming Interface) to integrate the existing system with a customer-facing mobile app from Dropcount, a cloud-based data analytics and customer engagement application for water utilities. Customers who opt-in can see their hourly water usage and turn their water on or off from their phone. This app will give customers the ability to remotely control the water supply to their house."

**Mueller did not disclose the installation, use, or profit/revenue associated with their wireless water meters in Santa Rosa County, Florida, in response to Rein Tech's Request for Production of Documents and Interrogatories.**

The Research Attorney found publicly available evidence that Mueller installed wireless water meters in **Calaveras County, California (Exhibit 10).**

> **Document 1** *Water Online* news article, source: Mueller Water Products, Mueller Awarded Contract For AMI Deployment in Calaveras County, CA, March 9, 2021. Statement: "Mueller Systems today announced that Calaveras County Water District has selected Mueller Systems to deploy an advanced metering infrastructure (AMI) network covering 1,000 with 13,000 AMI endpoints. …The project will provide new state-of-the-art metering technology to the area, allowing Calaveras County to capture hourly meter readings in near real-time and provide accurate data to the District's water billing system. The Sentryx™ software enabled Mi.Net AMI system uses a LoRa® enabled radio device that is attached to the newly installed meter and digital register to transmit water usage information over a secure network. The Sentryx water intelligence platform provides analytical data and insights, enabling water utilities to make informed strategic and day-to-day operational decisions. The new endpoints are also capable of identifying potential leaks and allowing customers to view their water usage, better manage consumption and conserve water."

**Mueller did not disclose the installation, use, or profit/revenue associated with their wireless water meters in Calaveras County, California, in response to Rein Tech's Request for Production of Documents and Interrogatories.**

The Research Attorney found publicly available evidence that Mueller installed wireless water meters in **South Daytona, Florida (Exhibit 11).**

> **Document 1** *Informed Infrastructure* news article: South Daytona brings efficiency, accuracy, and safety to water usage with Mueller Systems NaaS AMI System with LoRaWAN, accessed Jan 14, 2024. Statements: "Today Mueller Systems, LLC announced that the City

> of South Daytona, Florida, will soon begin deployment of the Mueller Systems' Network as a Service (NaaS) AMI System with LoRaWAN. The LoRaWAN endpoints will efficiently collect data remotely and provide South Daytona with visibility into its customers' water consumption. …The Mi.Net® node with LoRaWAN is a bi-directional endpoint capable of transmitting secure data to and from the network server within seconds. At this unprecedented speed of communication, on-demand reads can be requested and received without delay. Near real-time data is available to customer service and operations, which will help identify and resolve leaks or billing issues quicker. Each LoRa-based endpoint maintains the data in its non-volatile onboard memory and communicates with the Mueller Systems Mi.Net® Advanced Metering Infrastructure (AMI) system. This data backup feature helps to ensure that South Daytona's water utility is protected against any single point of failure. Alerts such as potential leaks, no flow, low flow, and register tampering are monitored by the Mueller Systems Network Operations Center to provide an added layer of security. Mueller Systems' NaaS offering means South Daytona does not have to worry about maintaining the network and can focus on customer service."

**Mueller did not disclose the installation, use, or profit/revenue associated with their wireless water meters in South Daytona, Florida, in response to Rein Tech's Request for Production of Documents and Interrogatories.**

The Research Attorney found publicly available evidence that Mueller installed wireless water meters in **West Slope, Oregon (Exhibit 12).**

> **Document 1 (Exhibit 12.1)** *Water World* article, AMR system boosts Oregon water district's meter reading speed, July 11, 2023. Statement (page 3): "These new Mueller Systems radios provide efficient, long-range two-way communication. LoRa -- short for long range -- is resistant to most interference in the 900 MHz band ensuring readings is reliable. This allows utilities to drive every other

street and drive at the posted speed limit."

**Document 2 (Exhibit 12.2)** Mueller's website content, Case Study: OREGON'S WEST SLOPE WATER DISTRICT EXPERIENCES 300% FASTER METER READINGS WITH MODULAR AMR SYSTEM, F14934 6/23. Statement (page 2): "The Mueller Systems AMR comes with EZ Reader™ Software – an easy-to-use local software that manages data collection for the entire route. The EZ Reader application is capable of interfacing with any billing system, including custom developed systems. This streamlines the process of data collection to data action, reducing the potential for human error from manual data entry."

**Mueller did not disclose the installation, use, or profit/revenue associated with their wireless water meters in West Slope, Oregon, in response to Rein Tech's Request for Production of Documents and Interrogatories.**

Plaintiff's investigation also confirmed from a Mueller Representative that Mueller's 420 RDM water meter is basically a Mueller Model 400 water meter with a control valve. The Mueller Representative stated that the Model 400 water meter with control valve has a length of seven inches (7") which facilitates fit within water meter box with connectors. The Mueller Representative also stated that they have ultrasonic water meters that have no moving parts in the water flow. The Mueller Representative explained that Mueller has two models of water meter registers (Mueller Solid State Register (SSR) and Mueller Encoder Eight (ME-8) rolling dial) that can communicate with a wireless node (LoRa or cellular) for any Mueller water

meter model. The Mueller Representative also stated that at least seven-hundred and fifty thousand (750,000) Mueller 420 RDM water meters had been deployed, sold, and are in operation in the U.S. Plaintiff's Research Attorney may have been unable to locate public or nonpublic sites and information, and it may take months or years to independently locate the at least seven-hundred and fifty thousand (750,000) Mueller 420 RDM that were sold and are in operation in the United States, or determine the income derived from these sales. Furthermore, this statement by the Mueller Representative is supported by the U.S. SEC EDGAR, Mueller Water Products, Inc. Form 10Q (filed 2025-02-05, reporting ending 2024-12-31) (*Id.*, Ex. 13) wherein *Mueller Water Products, Inc.* reported net sales of $256.4 million in 2023 and $304.3 million in 2024 with a gross profit of $86.5 million in 2023 which increased to $103.0 million in 2024. (*Id.*, Ex. 13, PDF page 4) Damages for patent infringement for the 2023 and 2224 calendar years for net sales at 3%, a reasonable royalty, equates to $7,602,000 for 2023 and $9,129,000 for 2024, total $16,731,000. Alternately, damages for patent infringement for the 2023 and 2224 calendar years for gross sales at 7%, a reasonable royalty, equates to $6,029,000 for 2023 and $7,210,000 for 2024, total $13,239,000. The '837 Patent published as issued and was enforceable as of January 10, 2023. Thus, Mueller's SEC 10Q SEC (filed 2025-02-05) is applicable and only accounts

for 2 years of net sales or 2 years of gross sales, while the '837 Patent is enforceable until at least the year 2036 - an additional 12 years.

The Defendants continued evasion of its obligation to provide discovery, taken in context of the fact that Plaintiff found information about site installations through publicly available sources and information that was reported to and filed with the SEC by the Defendant, should justify sanctions to be imposed on the Defendant. In addition, the Court should compel the Defendant to compensate the Plaintiff for all costs associated with the Research Attorney who uncovered information that the Defendant evaded and hid.

## C. DEFENDANT CONTINUES TO PRACTICE THE TECHNOLOGY DISCLOSED IN THE PATENT-IN-SUIT

Defendant continues to practice the claims of Rein Tech's Patent-in-Suit, and specifically the claims of the '837 Patent. In its original, first amended, and second amended Complaints, Plaintiff provided claims charts that demonstrate Mueller's wireless water meters practice and infringe the claims of Rein Tech's Patent-in-Suit. Defendant's responses to Interrogatories Nos. 2, 4, 5, and 8; Defendant's emails; Plaintiff's claim charts; and Plaintiff's independent research all confirm that Mueller practices the claims of Rein Tech's Patent-in-Suit.

## III. CONCLUSION

Plaintiff and prior litigation counsel were frustrated with the Defendant's Failure to Answer the Plaintiff's requested Production of Documents and Defendant's emails claiming that "Document Request No. 2. is $0 for all requested categories, with no responsive documents to produce." Plaintiff's own research identified at least five sites that were actively contracted with the Defendant to deploy water meters and to operate a wireless network that were performed during the discovery period. It was stated that at least seven-hundred and fifty thousand (750,000) Mueller 420 RDM water meters have been deployed, sold, and are in operation in the U.S. Mueller's SEC document produced in this Testimony (*Id.*, Ex. 13) also contradicts the Defendant's assertation that zero money was generated where the net sales were reported as $7,602,000 for 2023 and $9,129,000 for 2024 and gross sales were $6,029,000 for 2023 and $7,210,000 for 2024.

I declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct.

[SIGNATURE PAGE FOLLOWS]

Executed on February 25, 2025.

/Michael Klicpera/

Michael Klicpera

Dated: February 26, 2025

Respectfully Submitted,
**JACK SHRUM, P.A.**

*/s/ Jack Shrum*_____
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# EXHIBIT E

UNITED STATES PATENT AND TRADEMARK OFFICE
P.O. Box 1450
Alexandria, VA 22313 - 1450
www.uspto.gov

# ELECTRONIC ACKNOWLEDGEMENT RECEIPT

| APPLICATION # | RECEIPT DATE / TIME | ATTORNEY DOCKET # |
|---|---|---|
| 16/356,870 | 07/22/2024 09:50:34 AM Z ET | 70991.01 |

## Title of Invention

Water Meter and Leak Detection System

## Application Information

| | | | |
|---|---|---|---|
| APPLICATION TYPE | Utility - Nonprovisional Application under 35 USC 111(a) | PATENT # | 11549837 |
| CONFIRMATION # | 3033 | FILED BY | Michael Klicpera |
| PATENT CENTER # | 66457112 | FILING DATE | 03/18/2019 |
| CUSTOMER # | 22509 | FIRST NAMED INVENTOR | Michael Edward Klicpera |
| CORRESPONDENCE ADDRESS | - | AUTHORIZED BY | - |

## Documents

**TOTAL DOCUMENTS: 10**

| DOCUMENT | PAGES | DESCRIPTION | SIZE (KB) |
|---|---|---|---|
| sb0044 Specification Page 1_21Jul2024 Master.pdf | 1 | Request for Certificate of Correction | 177 KB |
| sb0044 Specification Page 2_21Jul2024 Master.pdf | 1 | Request for Certificate of Correction | 177 KB |
| sb0044 Specification Page 3_21Jul2024 Master.pdf | 1 | Request for Certificate of Correction | 177 KB |
| sb0044 Specification Page 4_21Jul2024 Master.pdf | 1 | Request for Certificate of Correction | 176 KB |
| sb0044 claim 42-Page 5_21Jul2024 Master.pdf | 2 | Request for Certificate of Correction | 182 KB |

| | | | |
|---|---|---|---|
| sb0044 claim 42-Page 6_21Jul2024 Master.pdf | 2 | Request for Certificate of Correction | 182 KB |
| sb0044 claim 42-44-Page 7_21Jul2024 Master.pdf | 2 | Request for Certificate of Correction | 182 KB |
| sb0044 claim 45-47a-Page 8_21Jul2024 Master.pdf | 2 | Request for Certificate of Correction | 182 KB |
| sb0044 claim 47b-51-Page 9_21Jul2024 Master.pdf | 2 | Request for Certificate of Correction | 182 KB |
| Word _Doc_claim_corrections_20Jul2024 pm_Master-LET..docx | 6 | Miscellaneous Incoming Letter | 30 KB |

## Digest

| DOCUMENT | MESSAGE DIGEST(SHA-512) |
|---|---|
| sb0044 Specification Page 1_21Jul2024 Master.pdf | BD0D299B8495AE298BAA8BBBFD72A225252AF9A1210DC1E6083EBA5B191398ECA4325B460A3509BF20075FC58505A55575A950CE4CB85B24D1CA07404B5D325B |
| sb0044 Specification Page 2_21Jul2024 Master.pdf | 5F10DC6EB820D9B919B2ACF4D4E33A4BEED90CB75703549F44A5264E76FBAD41F756CE7D2D7163C4D8EC6E4D561F5E84935C13200236006BC3EBDBF1C010E38E |
| sb0044 Specification Page 3_21Jul2024 Master.pdf | B0225422B171FC40742DD06C3B8D2644CAE3B11D991C343E5F226B47DF8EB7D53AAF813101787DC50A66A8CAD680612CE4E039539D2AE0127584600CA5D5C28A |
| sb0044 Specification Page 4_21Jul2024 Master.pdf | EC094C7AE1F9E13F28BC6AD6FAAF74222FEFC51F62E859426BD1E178BCEB53B4F2F4973F04A57344C8B6BE58DD9331E7AE952B208D6D72D316BCD254FA2498E0 |
| sb0044 claim 42-Page 5_21Jul2024 Master.pdf | D3892E8D374093C1323FCEAA8860D3DBEDAC5DE67E95B167713672D2FBE9801347B5FA3383E76ED889C79D07AB6DA8773 |

| | |
|---|---|
| | 9E72A11EA02364B912A36959B9735DC |
| sb0044 claim 42-Page 6_21Jul2024 Master.pdf | A24A8FC83EA1815502A69C3569004743635F76F53DA3C2F89A857E831B22F0751726C106C424959C6DAC9D4F9827AD88D1F8DC88D6B34B15625E3D99E4698080 |
| sb0044 claim 42-44-Page 7_21Jul2024 Master.pdf | E6D3CDCE9BF0AF9BF57D4BF01665D8A4C5FD3863911775174 65A5DDA4FA0D83164EE6275C95CF0B3D7C57D77D1E992CDB A0FDA03F9A040C6965AFF3ACA7D0065 |
| sb0044 claim 45-47a-Page 8_21Jul2024 Master.pdf | 35469C8D3B96A69FB2173A58B34073127D5B48E3709699D652 44700B169F311BBE9D6A0B237E29581CD79E75A0C113A51D0 C8E0A930121311373C1C4F1437FF3 |
| sb0044 claim 47b-51-Page 9_21Jul2024 Master.pdf | B3FD10D21B8FB177B10F8256F43E00D008A1FFA20D27E8A58 554F7F4037FB5C67EEEB44DA9D30AC2ECC86D008E1E34107 F8A1300FD1744EC134AE21443FB5D41 |
| Word _Doc_claim_corrections_20Jul2024 pm_Master-LET..docx | ECAB6FCF967D66258B09B53F1F8BF1D169C4A63667FEB52D6 405EC33B79A1D897FF2DCECC6DF7BAFE9F364133183952352 E24C95E3580FEDC2C58D1CB2C15E03 |

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

**New Applications Under 35 U.S.C. 111**

If a new application is being filed and the application includes the necessary components for filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

**National Stage of an International Application under 35 U.S.C. 371**

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

**New International Application Filed with the USPTO as a Receiving Office**

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

42. A water meter and leak detection system comprising:

a base station having a water control valve mechanism interposed between a main water ~~supply line~~ source and a water supply line for a building or a structure;

~~said~~ the base station further comprising[[;]]:

a) an electrical circuitry including at least one of a CPU, a microprocessor, or a ~~and~~ microcontroller, or any combination thereof ~~with a power source~~;

b) one or more flow rate ~~sensor~~ sensors connected to the ~~main~~ water supply line ~~and connected to said electrical circuitry~~ and designed to monitor at least one of a water use data, a water energy use data, a water quality data ~~and~~, or a leak detection information, or any combination thereof, from ~~said~~ the building or the structure, ~~said~~ the one or more flow rate sensors ~~connected to the main water supply and~~ connected with ~~said~~ the electrical circuitry;

c) ~~said~~ a power source that is at least one of an AC powered, a DC powered, ~~and~~ or a one or more standard or rechargeable batteries, or any combination thereof, ~~said~~ the rechargeable batteries capable of being supplemented with a turbine or other rotational mechanism that generates electrical energy, the ~~said~~ power source is electrically connected to ~~said~~ the electrical circuitry;

d) one or more wireless communication technologies comprising at least one of a LoRa, a Sigfox, an Ultra Narrow Band (UNB), ~~6LowPAN~~ a 6LoWPAN, a WiMAX, a NB-IoT, a 3GPP cellular, a 4G/LTE-M cellular, ~~and~~ or a 5G cellular technology, or any combination thereof;

e) wherein ~~said~~ the one or more wireless communication technologies utilizes authentication and encryption technologies for pairing operations and to prevent unauthorized access to ~~the~~ a water data or information; and

f) wherein the ~~long-range~~ one or more wireless communication technologies comprising at least one of the LoRa, the Sigfox, ~~UNB, NB-IoT,~~ the Ultra Narrow Band (UNB), the 6LoWPAN, the WiMAX, ~~cellular technology~~ the NB-IoT, the 3GPP ~~and~~ cellular, the 4G/LTE-M ~~and~~ cellular, or the 5G ~~consist~~ cellular technology, or any combination thereof, consists of a duplex technology to ~~both receive at least one of a~~ transmit the water use data, the water energy use data, the water quality data, or the ~~and~~ leak detection information, or any combination thereof, and send commands to regulate the water control valve mechanism;

the CPU, the microprocessor, or the microcontroller ~~can at least include one of~~ , or any combination thereof, includes at least one of a programming setting managed by ~~the~~ a user[[,]] to remotely set a mode setting~~, and~~ or modify a default ~~or restricted~~ setting processed by ~~the~~ a ~~manufacturing factory~~ manufacturer to:

a) record ~~the~~ a water flow event to ~~a local~~ an integrated memory bank or a removable memory device for ~~regional or controlled~~ analysis[[,]];

b) combine a plurality of water ~~low~~ flow events into ~~a local~~ the integrated memory bank and subsequently schedule the transfer of the water flow ~~event dataset~~ events to a ~~remote computer or server~~ one or more remote computers or servers[[,]] or to a cloud ~~service~~ computing company[[,]];

c) ~~directly~~ transfer the water ~~.flow~~ flow event to ~~a remote computer or server~~ the one or more remote computers or servers ~~, or to a~~ or to the cloud ~~service~~ computing company~~, or~~;

d) transfer the water ~~flow~~ data or information utilizing a blockchain ~~format~~ technology to the one or more remote computers or servers[[,]] or to the cloud ~~service~~ computing company; ~~and~~

e) modify water units or timing units;
(support in 18:44, 26:1-4, 27:44-45, 34: 58-60, 51:14-15)

f) establish alarm set points;
(support in 18:44, 26:1-4, 27:44-45, 34: 58-60, 51:14-15)

or any combination thereof; and

the one or more wireless communication technologies ~~capable of~~ configured to:

(i) ~~transmitting~~ transmit at least one of ~~a 1)~~ the water use data, the water energy use data, the water quality data, or the ~~and~~ leak detection information ~~and,~~ , or any combination thereof, to the one or more remote computers or servers or to the cloud computing company; and

(ii) ~~2) obtains~~ receive an instruction or signal to command the management of the water control valve mechanism or perform [[a]] another command operation[[,]];

using at least one of an Internet connection, a private network system, ~~and~~ or a corporate owned network system~~, and~~ that communicates with a smart phone, a computer, a server, a tablet, a web portal, ~~and other~~ or another electronic communication device ~~, that communicates with at least one of a remote computer or server, a commercial cloud company, and a web-based company~~.

43. A water meter and leak detection system as recited in claim 42, further comprising a temperature sensor in close proximity to ~~said~~ the water supply line, ~~said~~ the temperature sensor ~~can communicate with said~~ communicates with the water meter and leak detection system and ~~initiate~~ initiates a water freezing protection ~~procedures~~ procedure when the water supply line approaches ~~the~~ a water freezing point of 32 degrees Fahrenheit or 0 degrees Celsius, ~~such~~ the freezing ~~procedures can include~~ protection procedure includes at least one of incorporating a freeze plug mechanism, draining ~~the~~ water distribution lines with a ~~three way~~ three-way valve, or replacing ~~the~~ water in the water supply line with an air, a nitrogen, or ~~other~~ another gas or a liquid with low freezing point.

44. A water meter and leak detection system as recited in claim 42, further comprising at least one of a pressure sensor ~~and~~ or an acoustic sensor ~~are capable of quantifying a~~ configurable to

quantify a leak condition when the water meter and leak detection system closes the water control valve mechanism ~~and monitors any~~ by monitoring pressure changes and ~~is~~ capable of transferring ~~pressure monitoring~~ monitored pressure or acoustic information to the base station for making a one or more software calculations to determine ~~the~~ a leak type or a leak category.

45. A water meter and leak detection system as recited in claim 42, further comprising one or more communication hubs ~~is~~ in wired communication with the base station or having a wireless communication ~~technologies~~ technology corresponding with the one or more wireless communication technologies of the base station, wherein the one or more communication hubs ~~that~~ transfers the water use data, the water energy use data, the water quality data ~~or a~~ , or the leak detection ~~condition~~ information, or any combination thereof, to at least one of ~~an~~ the Internet connection, the private network system, ~~and~~ or the corporate owned network system that communicates with ~~at least one of a remote computer or server, a commercial cloud-company and a web-based~~ company the one or more remote computers or servers or with the cloud computing company.

46. A water meter and leak detection system as recited in claim 42, ~~is capable have a~~ further comprising a second wireless communication technology utilizing at least of one of a Bluetooth, a Bluetooth low energy, ~~and~~ or a Wi-Fi wireless ~~technologies~~ technology for performing an authentication pairing procedure to initially ~~establishing~~ establish remote wireless communications by inputting a network username and a password, ~~scan~~ scanning a QR code, or performing ~~or perform~~ a two-step authentication scheme, or any combination thereof.

47. A water meter and leak detection system as recited in claim 42, wherein an owner or the user ~~can communicate~~ communicates with at least one of [[a]] the smart phone, the computer, the server, the tablet, the web portal, or the ~~and one or more~~ other electronic communication ~~devices~~ device that includes a software program ~~application capable of~~ displaying an icon, a menu, or a submenu that provides at least one function of:

(a) providing a graphical display of at least one of the water use ~~history,~~ data, the water energy ~~usage history, and~~ use data, or the water quality ~~history~~ data, or any combination thereof, from a selected water fixture or a water appliance, ~~said history~~ the water data or information transferred from at least one of ~~said~~ the base station, ~~said~~ a remote central computer, or ~~and~~ the cloud ~~service provider or web-based computer~~ computing company;

(b) displaying an alarm condition based on one of ~~said~~ the water use ~~history,~~ data, the water energy ~~usage history, or~~ use data, or the water quality ~~history~~ data, or any combination thereof, and programmed into ~~said~~ the base station;

(c) turning on or off ~~the~~ a water supply by sending a command signal ~~transferred~~ to the base station;

(d) showing or modifying [[a]] the software program, a setting, or a default menu ~~incorporated~~ included within the base station;

(e) ~~Specifying~~ identifying an operational position of the water control valve mechanism ~~operational position~~ by sending a request to the base station;

(f) downloading updates or regional water rates into the base station; ~~and~~ or

(g) programming a vacation or work water schedule into the base station.

48. A water meter and leak detection system as recited in claim 45[[42]], wherein ~~one of collection nodes are capable of including~~ the base station includes at least one of a mesh ~~and/or and~~ or a peer-to-peer technology circuitry that ~~can communicate~~ communicates with ~~at least one of another water meter collection nodes and~~ a one or more base stations or the one or more communication hubs.

49. A water meter and leak detection system as recited in claim 45[[42]], wherein ~~one of~~ the one or more communication hubs ~~are capable of including~~ includes at least one of a mesh ~~and/or and~~

or a peer-to-peer technology circuitry that ~~can communicate~~ communicates with ~~at least one of another water meter collection nodes and communication hubs~~ a one or more base stations.

50. A water meter and leak detection system as recited in claim 42, further comprising a one or more wired communication technology comprising at least one of ~~a~~ an X10, an UPB, ~~and~~ or a HART technology.

51. A water meter and leak detection system as recited in claim 42, ~~further comprising that~~ wherein the one or more wireless communication technologies ~~capable of transferring~~ transfers to ~~the internet~~ the Internet, the water use data, the water energy use data, the water quality data, or the leak detection information ~~detecting leak conditions~~, or any combination thereof, and ~~sending~~ transmits a control signal utilizing ~~block chain~~ the blockchain technology.

PTO/SB/44 (09-07)
Approved for use through 03/31/2026. OMB 0651-0033
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.
(Also Form PTO-1050)

# UNITED STATES PATENT AND TRADEMARK OFFICE
## CERTIFICATE OF CORRECTION



PATENT NO. : 11,549,837

APPLICATION NO.: 16/356,870

ISSUE DATE : Jan 10, 2023

INVENTOR(S) : KLICPERA, Michael

It is certified that an error appears or errors appear in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

In the issued '837 Specification - include the following corrections:

1:26-39, after [facilities, and] insert "utilities/"
7-13-18, after [received.] delete "Block chain" and substitute with - - Blockchain - -
23:20-46, after [archaic when] delete "block chain" and substitute with - - blockchain - -;
25:28-58, after [non-repudiation] insert - - (or blockchain) - -; delete "Block Chain" and substitute with - - blockchain - -;
26:23-40, after [LoRa,] delete "WiNAX" and substitute with - - WiMAX - -;
44:46-58, after [currency) 318] insert - - , the weekly total use of water 326 and the weekly total cost in dollars 328 - -

Replace paragraph 1:26-39 as follows:

Water is increasingly becoming a precious resource. While freshwater supplies have been challenged due to climate (short rainy seasons and long droughts) and increased pollution, water demand has been rising due to the growing population along with increased development. The increasingly limited supply of fresh water is a humanitarian concern and water conservation is becoming a major issue for many communities. An apparatus for real-time monitoring of water use and real-time detection of leak conditions at private and/or public property (ies) (e.g., residential structures and yards, business/industrial/commercial facilities, and utilities/governmental/institutional sites) can be useful in assessing and controlling water resources and supporting water conservation.

Replace paragraph 7:13-18 as follow:

In the water meter environment, non-repudiation refers to the technology that confirms or ensures and prevents a sender or receiver from denying that a message(s), control/command signal(s), data, and/or information was sent or received. Blockchain technology is an upcoming technology that will ensure non-repudiation compliance.

MAILING ADDRESS OF SENDER (Please do not use Customer Number below):

A Federal agency may not conduct or sponsor, and a person is not required to respond to, nor shall a person be subject to a penalty for failure to comply with an information collection subject to the requirements of the Paperwork Reduction Act of 1995, unless the information collection has a currently valid OMB Control Number. The OMB Control Number for this information collection is 0651-0033. Public burden for this form is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the information collection. Send comments regarding this burden estimate or any other aspect of this information collection, including suggestions for reducing this burden to the Chief Administrative Officer, United States Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450 or email InformationCollection@uspto.gov. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. If filing this completed form by mail, send to: **Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

*If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.*

PTO/SB/44 (09-07)
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# UNITED STATES PATENT AND TRADEMARK OFFICE
## CERTIFICATE OF CORRECTION



PATENT NO. : 11,549,837

APPLICATION NO.: 16/356,870

ISSUE DATE : Jan 10, 2023

INVENTOR(S) : KLICPERA, Michael

It is certified that an error appears or errors appear in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

In the issued '837 Specification:

Replace paragraph 23:20-46 as follows:

In the water meter environment, non-repudiation refers to the technology that confirms or ensures and prevents a sender or receiver from denying that a message(s), control/command signal(s), data, and/or information was sent or received. Blockchain technology is an upcoming technology that will ensure non-repudiation compliance.

Replace paragraph 25:28-58 as follows:

Several current security techniques that utilize public key cryptography are the Public Key Infrastructure (PKI), the Public Key Encryption (PKE) and the Digital Signature protocols. PKI enables digital certificates to be used to electronically identify an individual or an organization. A PKI requires a certificate authority (CA) that issues and verifies digital certificates and can utilize a registration authority (RA) that acts as the verifier of the CA when a new digital certificate is issued. PKE is a message or command signal that is encrypted with a recipient's public key. The message cannot be decrypted by any individual or machine that does not possess the matching private key. PKE is a security protocol that is used to maintain confidentiality, Similarly, Digital signatures are also utilized with key pair technology, in association with authentication, integrity and non-repudiation confidentiality techniques. In practice, when a user transmits a message or signal or data with a digital signature, the message or signal includes a one-way hash prior to transmission, and the recipient uses the sender's public key to decrypt the hash and verify the digital signature. PKI, PKE, and digital signers are currently being supplemented with two factor authentication that utilizes a confirmation protocol after password input with a follow up email, phone call, or utilizing a authenticator number scheme. Furthermore, the PKI, PKE and digital signature techniques might become archaic when blockchain technology becomes more generally adopted.

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In the issued '837 Specification:

Replace paragraph 26:23-40 as follows:

Encryption, authentication, integrity and non-repudiation or blockchain may be important characteristics when the water meter and leak detection system 10 (126 shown in FIGS. 6 and 200 shown in FIG. 7 ) is transferring water use or water quality data or information to a remote server/database via a public or private network that provide wireless subsequent access to registered computers and cell, smart and mobile phones 400. When the water mater and leak detection system 10 (126 shown in FIGS. 6 and 200 shown in FIG. 7 ) receives or uploads data and information such as a control command signal to send or transmit data and information it is critical that the device can authenticate the sender and be sure of the integrity of the data and information. Encryption provides privacy by converting the data or information into an "encrypted" code to prevent unauthorized access. Encryption can be provided point-to-point, or end-to-end, and transmit messages using encryption schemes such as Pretty Good Privacy (PGP), Secure/Multipurpose Internet Email (S/MIME), XML, or SSL encryption protocols. Non-repudiation prevents the sender from denying that they sent or received data/information or a message. Non-repudiation can be provided by signing, electronic witnessing and technologies that assert a document was read before it was signed. One of the main advantages of the blockchain technology is that non-repudiation is nearly immutable. Here, the water meter and leak detection system 10 (126 shown in FIGS. 6 and 200 shown in FIG. 7 ) can include digital signature technology, data packets or messages using PGP, S/MIE, XML and Digital Signature, TLS/SSL and two-step authentication to provide for non-repudiation of those messages, information or data.

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In the issued '837 Specification:

Replace paragraph 44:46-58 as follows:

FIG. 11 shows an example of an application or page (APP) 300 for Water Use 302 having a daily 304 graph 306 with day hours 308, designated by the symbol AM 312 and the night hours 310 designated by the symbol PM 314. At the right side of the example application or page (APP) 300 is the daily total use of water 316 and the daily total cost in dollars (or other currency) 318 the weekly total use of water 326 and the weekly total cost in dollars 328, and the monthly total use of water 336 and the monthly total cost in dollars 338 by year 334 per regional water rates that has been downloaded the data 340 from the registered or serving water municipality. Within the daily graph 306 is a plotted line 307 that shows the hourly water use. The plotted line 307 can have a rolling feature whereby new data replaces the oldest data in the graph. A gallon or liter scale can be included on the left side of the daily graph 305 (not shown).

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ISSUE DATE : JAN 10, 2023

INVENTOR(S) : KLICPERA, Michael

It is certified that an error appears or errors appear in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

42. A water meter and leak detection system comprising:

a base station having a water control valve mechanism interposed between a main water source and a water supply line for a building or a structure;

the base station further comprising:

a) an electrical circuitry including at least one of a CPU, a microprocessor, or a microcontroller, or any combination thereof;

b) one or more flow rate sensors connected to the water supply line and designed to monitor at least one of a water use data, a water energy use data, a water quality data, or a leak detection information, or any combination thereof, from the building or the structure, the one or more flow rate sensors connected with the electrical circuitry;

c) a power source that is at least one of an AC powered, a DC powered, or a one or more standard or rechargeable batteries, or any combination thereof, the rechargeable batteries capable of being supplemented with a turbine or other rotational mechanism that generates electrical energy, the power source is electrically connected to the electrical circuitry;

d) one or more wireless communication technologies comprising at least one of a LoRa, a Sigfox, an Ultra Narrow Band (UNB), a 6LoWPAN, a WiMAX, a NB-IoT, a 3GPP cellular, a 4G/LTE-M cellular, or a 5G cellular technology, or any combination thereof;

e) wherein the one or more wireless communication technologies utilizes authentication and encryption technologies for pairing operations and to prevent unauthorized access to a water data or information; and

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INVENTOR(S) : KLICPERA, Michael

It is certified that an error appears or errors appear in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

f) wherein the one or more wireless communication technologies comprising at least one of the LoRa, the Sigfox, the Ultra Narrow Band (UNB), the 6LoWPAN, the WiMAX, the NB-IoT, the 3GPP cellular, the 4G/LTE-M cellular, or the 5G cellular technology, or any combination thereof, consists of a duplex technology to transmit the water use data, the water energy use data, the water quality data, or the leak detection information, or any combination thereof, and send commands to regulate the water control valve mechanism;

the CPU, the microprocessor, or the microcontroller, or any combination thereof, includes at least one of a programming setting managed by a user to remotely set a mode setting or modify a default setting processed by a manufacturer to:

a) record a water flow event to an integrated memory bank or a removable memory device for analysis;

b) combine a plurality of water flow events into the integrated memory bank and subsequently schedule the transfer of the water flow events to a one or more remote computers or servers or to a cloud computing company;

c) transfer the water flow event to the one or more remote computers or servers or to the cloud computing company;

d) transfer the water data or information utilizing a blockchain technology to the one or more remote computers or servers or to the cloud computing company;

e) modify water units or timing units;

f) establish alarm set points;

or any combination thereof; and

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INVENTOR(S) : KLICPERA, Michael

It is certified that an error appears or errors appear in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

the one or more wireless communication technologies configured to:

(i) transmit at least one of the water use data, the water energy use data, the water quality data, or the leak detection information, or any combination thereof, to the one or more remote computers or servers or to the cloud computing company; and

(ii) receive an instruction or signal to command the management of the water control valve mechanism or perform another command operation;

using at least one of an Internet connection, a private network system, or a corporate owned network system that communicates with a smart phone, a computer, a server, a tablet, a web portal, or another electronic communication device.

43. A water meter and leak detection system as recited in claim 42, further comprising a temperature sensor in close proximity to the water supply line, the temperature sensor communicates with the water meter and leak detection system and initiates a water freezing protection procedure when the water supply line approaches a water freezing point of 32 degrees Fahrenheit or 0 degrees Celsius, the freezing protection procedure includes at least one of incorporating a freeze plug mechanism, draining water distribution lines with a three-way valve, or replacing water in the water supply line with an air, a nitrogen, or another gas or a liquid with low freezing point.

44. A water meter and leak detection system as recited in claim 42, further comprising at least one of a pressure sensor or an acoustic sensor configurable to quantify a leak condition when the water meter and leak detection system closes the water control valve mechanism by monitoring pressure changes and capable of transferring monitored pressure or acoustic information to the base station for making a one or more software calculations to determine a leak type or a leak category.

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45. A water meter and leak detection system as recited in claim 42, further comprising one or more communication hubs in wired communication with the base station or having a wireless communication technology corresponding with the one or more wireless communication technologies of the base station, wherein the one or more communication hubs transfers the water use data, the water energy use data, the water quality data, or the leak detection information, or any combination thereof, to at least one of the Internet connection, the private network system, or the corporate owned network system that communicates with company the one or more remote computers or servers or with the cloud computing company.

46. A water meter and leak detection system as recited in claim 42, further comprising a second wireless communication technology utilizing at least of one of a Bluetooth, a Bluetooth low energy, or a Wi-Fi wireless technology for performing an authentication pairing procedure to initially establish remote wireless communications by inputting a network username and a password, scanning a QR code, or performing a two-step authentication scheme, or any combination thereof.

47. A water meter and leak detection system as recited in claim 42, wherein an owner or the user communicates with at least one of the smart phone, the computer, the server, the tablet, the web portal, or the other electronic communication device that includes a software program displaying an icon, a menu, or a submenu that provides at least one function of:

(a) providing a graphical display of at least one of the water use data, the water energy use data, or the water quality data, or any combination thereof, from a selected water fixture or a water appliance, the water data or information transferred from at least one of the base station, a remote central computer, or the cloud computing company;

(b) displaying an alarm condition based on one of the water use data, the water energy use data, or the water quality data, or any combination thereof, and programmed into the base station;

(c) turning on or off a water supply by sending a command signal to the base station;

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(continue claim 47)

(d) showing or modifying the software program, a setting, or a default menu included within the base station;

(e) identifying an operational position of the water control valve mechanism by sending a request to the base station;

(f) downloading updates or regional water rates into the base station; or

(g) programming a vacation or work water schedule into the base station.

48. A water meter and leak detection system as recited in claim 45, wherein the base station includes at least one of a mesh or a peer-to-peer technology circuitry that communicates with a one or more base stations or the one or more communication hubs.

49. A water meter and leak detection system as recited in claim 45, wherein the one or more communication hubs includes at least one of a mesh or a peer-to-peer technology circuitry that communicates with a one or more base stations.

50. A water meter and leak detection system as recited in claim 42, further comprising a one or more wired communication technology comprising at least one of a an X10, an UPB, or a HART technology.

51. A water meter and leak detection system as recited in claim 42, wherein the one or more wireless communication technologies transfers to the Internet, the water use data, the water energy use data, the water quality data, or the leak detection information, or any combination thereof, and transmits a control signal utilizing the blockchain technology.

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# EXHIBIT F

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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 16/356,870 | 03/18/2019 | Michael Edward Klicpera | 70991.01 | 3033 |

22509 7590 08/27/2024

Patent Technology, Inc.
Michael Edward Klicpera
PO BOX 4750
INCLINE VILLAGE, NV 89450-4750

| EXAMINER | |
|---|---|
| HAILE, BENYAM | |

| ART UNIT | PAPER NUMBER |
|---|---|
| 2688 | |

| NOTIFICATION DATE | DELIVERY MODE |
|---|---|
| 08/27/2024 | ELECTRONIC |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

debonair7@att.net

| Response to the Request for Certificate of Correction | Patent No. 11549837 | Applicant(s) Klicpera, Michael Edward |
|---|---|---|
| | Issue Date 01/10/2023 | Docket No. 70991.01 |

This is in response to the request for a Certificate of Correction filed 22 July 2024

☑ **Request Denied** - Consideration has been given to your request for the issuance of a Certificate of Correction under the provisions of 37 CFR 1.322 and/or 37 CFR 1.323. The Request is improper and denied for the reason(s) below:

1. ☐ Assignees' names and addresses (assignment data) printed in a patent, are based solely on information supplied in the appropriate space for identifying the assignment data on the Issue Fee Transmittal Form (PTOL-85b). Any request for a patent to be corrected to state the name of the assignee, must state that the assignment was submitted for recordation as set forth in in 37 CFR 3.11 before issuance of the patent. Petition under 3.81 is to be filed for consideration of correction to assignee. The petition fee set forth in 37 CFR 1.17(i)(1) (currently $140, $70, $35 for large, small and micro entities, respectively.

2. ☐ The alleged error in _____, is in fact an Amendment and/or Change made by the examiner and considered to be in accordance with the permissible amendments enumerated in the Manual of Patent Examining Procedure (MPEP) Section 1302.04. Applicant did not file objection or amendment under 37 CFR 1.312 prior to payment of the issue fee.

3. ☐ A petition under CFR 1.182 is required to correct the alleged errors in spelling or order of inventor's names, since inventor's names are printed solely in accordance with the type-written names, and in the order of the type-written names on the Application Data Sheet (ADS). The required fee currently under rule 1.17(f) (small entity $200, large entity $400, micro entity fee $100).

4. ☐ With respect to the alleged error in changing the inventor name on the patent due to clerical error in ADS/OATH of related patents. The inventors name is printed in accordance with the OATH/ADS submitted at the time of filing the application. However, your attention is directed to C.F.R. 1.324, wherein a request is being made to change, add or delete inventor(s), after issuance of the patent.

5. ☐ With respect to the alleged error in _____, comparison of the printed patent with the corresponding location in the application file reveals that there is no discrepancy.

6. ☐ With respect to 37 CFR 1.72, the title should be brief but technically accurate and descriptive and should contain fewer than 500 characters. Inasmuch as the words "new," "improved," "improvement of," and "improvement in" are not considered as part of the title of an invention, these words should not be included at the beginning of the title of the invention and will be deleted when the Office enters the title into the Offices computer records, and when any patent issues.

7. ☐ The fee for correction under 37 CFR 1.323 is set forth in 37 CFR 1.20(a). ☐ Partial fee ☐ No fee was received with your request. Full fee payment is required before further action is taken on this request.

8. ☐ With respect to the request for corrected Letters Patent (Grant), corrections to the original Letters Patent are made under the provisions of Rule 1.322(b), not Rule1.323, unless a petition is granted.

9. ☑ Other Comments: See Continuation Sheet

*Further correspondence concerning this matter should be filed and directed to the Certificates of Correction Branch.*

Legal Instrument Examiner: Ernest A Marfo Phone: (571)272-9344

Certificates of Correction Branch email: CustomerServiceCoC@uspto.gov CoC Central Phone Number: (703)756-1814

*If applicable, information regarding a petition under 37 CFR 1.183 should be directed to the attention of the Commissioner for Patents using the FAX number (571) 273-8300*

U.S. Patent and Trademark Office Part of Paper No. 20240823
PTO-998 (Rev. 10/2014)

Continuation of Other Comments: Please clarify, columns and the numbers next to the paragraphs. Columns 7, 13-18 the request does not exist.

# EXHIBIT G

UNITED STATES PATENT AND TRADEMARK OFFICE

P.O. Box 1450
Alexandria, VA 22313 - 1450
www.uspto.gov

# ELECTRONIC ACKNOWLEDGEMENT RECEIPT

| APPLICATION # | RECEIPT DATE / TIME | ATTORNEY DOCKET # |
|---|---|---|
| **16/356,870** | **09/16/2024 11:10:47 AM Z ET** | **70991.01** |

## Title of Invention

Water Meter and Leak Detection System

## Application Information

| | | | |
|---|---|---|---|
| APPLICATION TYPE | Utility - Nonprovisional Application under 35 USC 111(a) | PATENT # | 11549837 |
| CONFIRMATION # | 3033 | FILED BY | Michael Klicpera |
| PATENT CENTER # | 67184651 | FILING DATE | 03/18/2019 |
| CUSTOMER # | 22509 | FIRST NAMED INVENTOR | Michael Edward Klicpera |
| CORRESPONDENCE ADDRESS | - | AUTHORIZED BY | - |

## Documents

**TOTAL DOCUMENTS: 10**

| DOCUMENT | PAGES | DESCRIPTION | SIZE (KB) |
|---|---|---|---|
| sb0044 claim 42-44-Page 7_21Jul2024 Master.pdf | 2 | Claims | 182 KB |
| sb0044 claim 42-Page 5_21Jul2024 Master.pdf | 2 | Claims | 182 KB |
| sb0044 claim 47b-51-Page 9_21Jul2024 Master.pdf | 2 | Claims | 182 KB |
| sb0044 claim 42-Page 6_21Jul2024 Master.pdf | 2 | Claims | 182 KB |
| sb0044 Specification Page 1_21Jul2024 Master.pdf | 1 | Specification | 177 KB |
| sb0044 claim 45-47a-Page 8_21Jul2024 Master.pdf | 2 | Claims | 182 KB |

| | | | |
|---|---|---|---|
| sb0044 Specification Page 3_21Jul2024 Master.pdf | 1 | Specification | 177 KB |
| sb0044 Specification Page 2_21Jul2024 Master.pdf | 1 | Specification | 177 KB |
| sb0044 Specification Page 4_21Jul2024 Master.pdf | 1 | Specification | 176 KB |
| Letter_CofC_837_16Sept2024-image.pdf | 2 | Miscellaneous Incoming Letter | 288 KB |

## Digest

| DOCUMENT | MESSAGE DIGEST(SHA-512) |
|---|---|
| sb0044 claim 42-44-Page 7_21Jul2024 Master.pdf | E6D3CDCE9BF0AF9BF57D4BF01665D8A4C5FD386391177517465A5DDA4FA0D83164EE6275C95CF0B3D7C57D77D1E992CDBA0FDA03F9A040C6965AFF3ACA7D0065 |
| sb0044 claim 42-Page 5_21Jul2024 Master.pdf | D3892E8D374093C1323FCEAA8860D3DBEDAC5DE67E95B167713672D2FBE9801347B5FA3383E76ED889C79D07AB6DA87739E72A11EA02364B912A36959B9735DC |
| sb0044 claim 47b-51-Page 9_21Jul2024 Master.pdf | B3FD10D21B8FB177B10F8256F43E00D008A1FFA20D27E8A58554F7F4037FB5C67EEEB44DA9D30AC2ECC86D008E1E34107FBA1300FD1744EC134AE21443FB5D41 |
| sb0044 claim 42-Page 6_21Jul2024 Master.pdf | A24A8FC83EA1815502A69C3569004743635F76F53DA3C2F89A857E831B22F0751726C106C424959C6DAC9D4F9827AD88D1F8DCB8D6B34B15625E3D99E4698080 |
| sb0044 Specification Page 1_21Jul2024 Master.pdf | 1D5F60F032CF662C4C74B2E762B5E9A647E6B01ABD07F529B3F1E4E9D3CA61465158E75AA2919957F2E6DE0B3EA5E611E1351E4ED5EC77D12F47346FEB3F41E7 |
| sb0044 claim 45-47a-Page 8_21Jul2024 Master.pdf | 35469CBD3B96A69FB2173A58B34073127D5B48E3709699D65244700B169F311BBE9D6A0B237E29581CD79E75A0C113A51D0CBE0A930121311373C1C4F1437FF3 |
| sb0044 Specification Page 3_21Jul2024 Master.pdf | B0225422B171FC40742DD06C3B8D2644CAE3B11D991C343E5F226B47DF8EB7D53AAF813101787DC50A66A8CAD680612CE4E039539D2AE0127584600CA5D5C28A |
| sb0044 Specification Page 2_21Jul2024 Master.pdf | 5F10DC6EB820D9B919B2ACF4D4E33A4BEED90CB75703549F44A5264E76FBAD41F756CE7D2D7163C4D8EC6E4D561F5E84935C13200236006BC3EBDBF1C010E38E |
| sb0044 Specification Page 4_21Jul2024 Master.pdf | EC094C7AE1F9E13F28BC6AD6FAAF74222FEFC51F62E859426BD1E178BCEB53B4F2F4973F04A57344C8B6BE58DD9331E7AE952B208D6D72D316BCD254FA2498E0 |

Letter_CofC_837_16Sept2024-image.pdf

7C2C98F136030B18C4DEDA4012D9DB130AFE3AF1F27C21C6FCD8D124383EDF693768691EAA1C05E788898ACADF15C6A8F4426C231BD316FB3C731B913BF9DC95

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

**New Applications Under 35 U.S.C. 111**

If a new application is being filed and the application includes the necessary components for filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application

**National Stage of an International Application under 35 U.S.C. 371**

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

**New International Application Filed with the USPTO as a Receiving Office**

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

| | | |
|---|---|---|
| In re application of: Klicpera | ) | |
| | ) | |
| Serial Number: 16/356,870 | ) | |
| | ) | Art Unit |
| Filed: 03-18-2019 | ) | 2688 |
| | ) | |
| Examiner: Benyam Haile | ) | |
| | ) | |
| For: Water Meter and Leak Detection System | ) | |
| | ) | |
| | ) | |
| Attorney Docket Number: 70991.01 | ) | |

Mail Stop Amendments
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Transmitted herewith the proposed correct for a minor error in the Certificate of Correction submitted on July 22, 2024.

DATED this 16th day of September 2024.

/Michael E. Klicpera/

Attorney for Applicant
Registration No. 38,044

## Summary of Corrections Proposed

In the Denial for the Request of Certificate of Corrections dated August 27, 2024, the examination team stated "Continuation of Other Comments: *Please clarify, columns and the numbers next to the paragraphs.* (italics added)

Columns 7, 13-18 the request does not exist."

But the actual request was minor error and listed as "7-13-18", not "7,13-18".

The correct version of this phrase should be amended to state:

7:13-18, after [received.] delete "Block chain" and substitute with - - Blockchain - -.

Applicant believe this correction is a minor error in accordance with the Certificate of Correction policy and corrects the examination team denial for the Certificate of Correction filed on July 22, 2024

Applicant has not added any new matter in these corrections.

/Michael Klicpera/

Michael Klicpera

PTO/SB/44 (09-07)
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# UNITED STATES PATENT AND TRADEMARK OFFICE
## CERTIFICATE OF CORRECTION



PATENT NO. : 11,549,837

APPLICATION NO.: 16/356,870

ISSUE DATE : Jan 10, 2023

INVENTOR(S) : KLICPERA, Michael

It is certified that an error appears or errors appear in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

In the issued '837 Specification - include the following corrections:

1:26-39, after [facilities, and] insert "utilities/"
7:13-18, after [received.] delete "Block chain" and substitute with - - Blockchain - -
23:20-46, after [archaic when] delete "block chain" and substitute with - - blockchain - -;
25:28-58, after [non-repudiation] insert - - (or blockchain) - -; delete "Block Chain" and substitute with - - blockchain - -;
26:23-40, after [LoRa,] delete "WiNAX" and substitute with - - WiMAX - -;
44:46-58, after [currency) 318] insert - - , the weekly total use of water 326 and the weekly total cost in dollars 328 - -

Replace paragraph 1:26-39 as follows:

Water is increasingly becoming a precious resource. While freshwater supplies have been challenged due to climate (short rainy seasons and long droughts) and increased pollution, water demand has been rising due to the growing population along with increased development. The increasingly limited supply of fresh water is a humanitarian concern and water conservation is becoming a major issue for many communities. An apparatus for real-time monitoring of water use and real-time detection of leak conditions at private and/or public property (ies) (e.g., residential structures and yards, business/industrial/commercial facilities, and utilities/governmental/institutional sites) can be useful in assessing and controlling water resources and supporting water conservation.

Replace paragraph 7:13-18 as follow:

In the water meter environment, non-repudiation refers to the technology that confirms or ensures and prevents a sender or receiver from denying that a message(s), control/command signal(s), data, and/or information was sent or received. Blockchain technology is an upcoming technology that will ensure non-repudiation compliance.

MAILING ADDRESS OF SENDER (Please do not use Customer Number below):

A Federal agency may not conduct or sponsor, and a person is not required to respond to, nor shall a person be subject to a penalty for failure to comply with an information collection subject to the requirements of the Paperwork Reduction Act of 1995, unless the information collection has a currently valid OMB Control Number. The OMB Control Number for this information collection is 0651-0033. Public burden for this form is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the information collection. Send comments regarding this burden estimate or any other aspect of this information collection, including suggestions for reducing this burden to the Chief Administrative Officer, United States Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450 or email InformationCollection@uspto.gov. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. If filing this completed form by mail, send to: **Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

*If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.*

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# UNITED STATES PATENT AND TRADEMARK OFFICE
## CERTIFICATE OF CORRECTION



PATENT NO. : 11,549,837

APPLICATION NO.: 16/356,870

ISSUE DATE : Jan 10, 2023

INVENTOR(S) : KLICPERA, Michael

It is certified that an error appears or errors appear in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

In the issued '837 Specification:

Replace paragraph 23:20-46 as follows:

In the water meter environment, non-repudiation refers to the technology that confirms or ensures and prevents a sender or receiver from denying that a message(s), control/command signal(s), data, and/or information was sent or received. Blockchain technology is an upcoming technology that will ensure non-repudiation compliance.

Replace paragraph 25:28-58 as follows:

Several current security techniques that utilize public key cryptography are the Public Key Infrastructure (PKI), the Public Key Encryption (PKE) and the Digital Signature protocols. PKI enables digital certificates to be used to electronically identify an individual or an organization. A PKI requires a certificate authority (CA) that issues and verifies digital certificates and can utilize a registration authority (RA) that acts as the verifier of the CA when a new digital certificate is issued. PKE is a message or command signal that is encrypted with a recipient's public key. The message cannot be decrypted by any individual or machine that does not possess the matching private key. PKE is a security protocol that is used to maintain confidentiality, Similarly, Digital signatures are also utilized with key pair technology, in association with authentication, integrity and non-repudiation confidentiality techniques. In practice, when a user transmits a message or signal or data with a digital signature, the message or signal includes a one-way hash prior to transmission, and the recipient uses the sender's public key to decrypt the hash and verify the digital signature. PKI, PKE, and digital signers are currently being supplemented with two factor authentication that utilizes a confirmation protocol after password input with a follow up email, phone call, or utilizing a authenticator number scheme. Furthermore, the PKI, PKE and digital signature techniques might become archaic when blockchain technology becomes more generally adopted.

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A Federal agency may not conduct or sponsor, and a person is not required to respond to, nor shall a person be subject to a penalty for failure to comply with an information collection subject to the requirements of the Paperwork Reduction Act of 1995, unless the information collection has a currently valid OMB Control Number. The OMB Control Number for this information collection is 0651-0033. Public burden for this form is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the information collection. Send comments regarding this burden estimate or any other aspect of this information collection, including suggestions for reducing this burden to the Chief Administrative Officer, United States Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450 or email InformationCollection@uspto.gov. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. If filing this completed form by mail, send to: **Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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# UNITED STATES PATENT AND TRADEMARK OFFICE
## CERTIFICATE OF CORRECTION



PATENT NO. : 11,549,837

APPLICATION NO.: 16/356,870

ISSUE DATE : Jan 10, 2023

INVENTOR(S) : KLICPERA, Michael

It is certified that an error appears or errors appear in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

In the issued '837 Specification:

Replace paragraph 26:23-40 as follows:

Encryption, authentication, integrity and non-repudiation or blockchain may be important characteristics when the water meter and leak detection system 10 (126 shown in FIGS. 6 and 200 shown in FIG. 7 ) is transferring water use or water quality data or information to a remote server/database via a public or private network that provide wireless subsequent access to registered computers and cell, smart and mobile phones 400. When the water mater and leak detection system 10 (126 shown in FIGS. 6 and 200 shown in FIG. 7 ) receives or uploads data and information such as a control command signal to send or transmit data and information it is critical that the device can authenticate the sender and be sure of the integrity of the data and information. Encryption provides privacy by converting the data or information into an "encrypted" code to prevent unauthorized access. Encryption can be provided point-to-point, or end-to-end, and transmit messages using encryption schemes such as Pretty Good Privacy (PGP), Secure/Multipurpose Internet Email (S/MIME), XML, or SSL encryption protocols. Non-repudiation prevents the sender from denying that they sent or received data/information or a message. Non-repudiation can be provided by signing, electronic witnessing and technologies that assert a document was read before it was signed. One of the main advantages of the blockchain technology is that non-repudiation is nearly immutable. Here, the water meter and leak detection system 10 (126 shown in FIGS. 6 and 200 shown in FIG. 7 ) can include digital signature technology, data packets or messages using PGP, S/MIE, XML and Digital Signature, TLS/SSL and two-step authentication to provide for non-repudiation of those messages, information or data.

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(Also Form PTO-1050)

# UNITED STATES PATENT AND TRADEMARK OFFICE
## CERTIFICATE OF CORRECTION



PATENT NO. : 11,549,837

APPLICATION NO.: 16/356,870

ISSUE DATE : Jan 10, 2023

INVENTOR(S) : KLICPERA, Michael

It is certified that an error appears or errors appear in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

In the issued '837 Specification:

Replace paragraph 44:46-58 as follows:

FIG. 11 shows an example of an application or page (APP) 300 for Water Use 302 having a daily 304 graph 306 with day hours 308, designated by the symbol AM 312 and the night hours 310 designated by the symbol PM 314. At the right side of the example application or page (APP) 300 is the daily total use of water 316 and the daily total cost in dollars (or other currency) 318 the weekly total use of water 326 and the weekly total cost in dollars 328, and the monthly total use of water 336 and the monthly total cost in dollars 338 by year 334 per regional water rates that has been downloaded the data 340 from the registered or serving water municipality. Within the daily graph 306 is a plotted line 307 that shows the hourly water use. The plotted line 307 can have a rolling feature whereby new data replaces the oldest data in the graph. A gallon or liter scale can be included on the left side of the daily graph 305 (not shown).

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A Federal agency may not conduct or sponsor, and a person is not required to respond to, nor shall a person be subject to a penalty for failure to comply with an information collection subject to the requirements of the Paperwork Reduction Act of 1995, unless the information collection has a currently valid OMB Control Number. The OMB Control Number for this information collection is 0651-0033. Public burden for this form is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the information collection. Send comments regarding this burden estimate or any other aspect of this information collection, including suggestions for reducing this burden to the Chief Administrative Officer, United States Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450 or email InformationCollection@uspto.gov. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. If filing this completed form by mail, send to: **Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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# UNITED STATES PATENT AND TRADEMARK OFFICE
## CERTIFICATE OF CORRECTION



PATENT NO. : 11,549,837

APPLICATION NO. : 16/356,870

ISSUE DATE : JAN 10, 2023

INVENTOR(S) : KLICPERA, Michael

It is certified that an error appears or errors appear in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

42. A water meter and leak detection system comprising:

a base station having a water control valve mechanism interposed between a main water source and a water supply line for a building or a structure;

the base station further comprising:

a) an electrical circuitry including at least one of a CPU, a microprocessor, or a microcontroller, or any combination thereof;

b) one or more flow rate sensors connected to the water supply line and designed to monitor at least one of a water use data, a water energy use data, a water quality data, or a leak detection information, or any combination thereof, from the building or the structure, the one or more flow rate sensors connected with the electrical circuitry;

c) a power source that is at least one of an AC powered, a DC powered, or a one or more standard or rechargeable batteries, or any combination thereof, the rechargeable batteries capable of being supplemented with a turbine or other rotational mechanism that generates electrical energy, the power source is electrically connected to the electrical circuitry;

d) one or more wireless communication technologies comprising at least one of a LoRa, a Sigfox, an Ultra Narrow Band (UNB), a 6LoWPAN, a WiMAX, a NB-IoT, a 3GPP cellular, a 4G/LTE-M cellular, or a 5G cellular technology, or any combination thereof;

e) wherein the one or more wireless communication technologies utilizes authentication and encryption technologies for pairing operations and to prevent unauthorized access to a water data or information; and

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A Federal agency may not conduct or sponsor, and a person is not required to respond to, nor shall a person be subject to a penalty for failure to comply with an information collection subject to the requirements of the Paperwork Reduction Act of 1995, unless the information collection has a currently valid OMB Control Number. The OMB Control Number for this information collection is 0651-0033. Public burden for this form is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the information collection. Send comments regarding this burden estimate or any other aspect of this information collection, including suggestions for reducing this burden to the Chief Administrative Officer, United States Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450 or email InformationCollection@uspto.gov. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. If filing this completed form by mail, send to: **Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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(Also Form PTO-1050)

# UNITED STATES PATENT AND TRADEMARK OFFICE
## CERTIFICATE OF CORRECTION



PATENT NO. : 11,549,837

APPLICATION NO.: 16/356,870

ISSUE DATE : Jan 10 2023

INVENTOR(S) : KLICPERA, Michael

It is certified that an error appears or errors appear in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

f) wherein the one or more wireless communication technologies comprising at least one of the LoRa, the Sigfox, the Ultra Narrow Band (UNB), the 6LoWPAN, the WiMAX, the NB-IoT, the 3GPP cellular, the 4G/LTE-M cellular, or the 5G cellular technology, or any combination thereof, consists of a duplex technology to transmit the water use data, the water energy use data, the water quality data, or the leak detection information, or any combination thereof, and send commands to regulate the water control valve mechanism;

the CPU, the microprocessor, or the microcontroller, or any combination thereof, includes at least one of a programming setting managed by a user to remotely set a mode setting or modify a default setting processed by a manufacturer to:

a) record a water flow event to an integrated memory bank or a removable memory device for analysis;

b) combine a plurality of water flow events into the integrated memory bank and subsequently schedule the transfer of the water flow events to a one or more remote computers or servers or to a cloud computing company;

c) transfer the water flow event to the one or more remote computers or servers or to the cloud computing company;

d) transfer the water data or information utilizing a blockchain technology to the one or more remote computers or servers or to the cloud computing company;

e) modify water units or timing units;

f) establish alarm set points;

or any combination thereof; and

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# UNITED STATES PATENT AND TRADEMARK OFFICE
## CERTIFICATE OF CORRECTION



PATENT NO. : 11,549,837

APPLICATION NO.: 16/356,870

ISSUE DATE : JAN 10, 2023

INVENTOR(S) : KLICPERA, Michael

It is certified that an error appears or errors appear in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

the one or more wireless communication technologies configured to:

(i) transmit at least one of the water use data, the water energy use data, the water quality data, or the leak detection information, or any combination thereof, to the one or more remote computers or servers or to the cloud computing company; and

(ii) receive an instruction or signal to command the management of the water control valve mechanism or perform another command operation;

using at least one of an Internet connection, a private network system, or a corporate owned network system that communicates with a smart phone, a computer, a server, a tablet, a web portal, or another electronic communication device.

43. A water meter and leak detection system as recited in claim 42, further comprising a temperature sensor in close proximity to the water supply line, the temperature sensor communicates with the water meter and leak detection system and initiates a water freezing protection procedure when the water supply line approaches a water freezing point of 32 degrees Fahrenheit or 0 degrees Celsius, the freezing protection procedure includes at least one of incorporating a freeze plug mechanism, draining water distribution lines with a three-way valve, or replacing water in the water supply line with an air, a nitrogen, or another gas or a liquid with low freezing point.

44. A water meter and leak detection system as recited in claim 42, further comprising at least one of a pressure sensor or an acoustic sensor configurable to quantify a leak condition when the water meter and leak detection system closes the water control valve mechanism by monitoring pressure changes and capable of transferring monitored pressure or acoustic information to the base station for making a one or more software calculations to determine a leak type or a leak category.

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# UNITED STATES PATENT AND TRADEMARK OFFICE
## CERTIFICATE OF CORRECTION



PATENT NO. : 11,549,837

APPLICATION NO.: 16/356,870

ISSUE DATE : Jan 10, 2023

INVENTOR(S) : KLICPERA, Michael

It is certified that an error appears or errors appear in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

45. A water meter and leak detection system as recited in claim 42, further comprising one or more communication hubs in wired communication with the base station or having a wireless communication technology corresponding with the one or more wireless communication technologies of the base station, wherein the one or more communication hubs transfers the water use data, the water energy use data, the water quality data, or the leak detection information, or any combination thereof, to at least one of the Internet connection, the private network system, or the corporate owned network system that communicates with company the one or more remote computers or servers or with the cloud computing company.

46. A water meter and leak detection system as recited in claim 42, further comprising a second wireless communication technology utilizing at least of one of a Bluetooth, a Bluetooth low energy, or a Wi-Fi wireless technology for performing an authentication pairing procedure to initially establish remote wireless communications by inputting a network username and a password, scanning a QR code, or performing a two-step authentication scheme, or any combination thereof.

47. A water meter and leak detection system as recited in claim 42, wherein an owner or the user communicates with at least one of the smart phone, the computer, the server, the tablet, the web portal, or the other electronic communication device that includes a software program displaying an icon, a menu, or a submenu that provides at least one function of:

(a) providing a graphical display of at least one of the water use data, the water energy use data, or the water quality data, or any combination thereof, from a selected water fixture or a water appliance, the water data or information transferred from at least one of the base station, a remote central computer, or the cloud computing company;

(b) displaying an alarm condition based on one of the water use data, the water energy use data, or the water quality data, or any combination thereof, and programmed into the base station;

(c) turning on or off a water supply by sending a command signal to the base station;

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# UNITED STATES PATENT AND TRADEMARK OFFICE
## CERTIFICATE OF CORRECTION



PATENT NO. : 11,549,837

APPLICATION NO.: 16/356,870

ISSUE DATE : Jan 10, 2023

INVENTOR(S) : KLICPERA, Michael

It is certified that an error appears or errors appear in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

(continue claim 47)

(d) showing or modifying the software program, a setting, or a default menu included within the base station;

(e) identifying an operational position of the water control valve mechanism by sending a request to the base station;

(f) downloading updates or regional water rates into the base station; or

(g) programming a vacation or work water schedule into the base station.

48. A water meter and leak detection system as recited in claim 45, wherein the base station includes at least one of a mesh or a peer-to-peer technology circuitry that communicates with a one or more base stations or the one or more communication hubs.

49. A water meter and leak detection system as recited in claim 45, wherein the one or more communication hubs includes at least one of a mesh or a peer-to-peer technology circuitry that communicates with a one or more base stations.

50. A water meter and leak detection system as recited in claim 42, further comprising a one or more wired communication technology comprising at least one of a an X10, an UPB, or a HART technology.

51. A water meter and leak detection system as recited in claim 42, wherein the one or more wireless communication technologies transfers to the Internet, the water use data, the water energy use data, the water quality data, or the leak detection information, or any combination thereof, and transmits a control signal utilizing the blockchain technology.

MAILING ADDRESS OF SENDER (Please do not use Customer Number below):

A Federal agency may not conduct or sponsor, and a person is not required to respond to, nor shall a person be subject to a penalty for failure to comply with an information collection subject to the requirements of the Paperwork Reduction Act of 1995, unless the information collection has a currently valid OMB Control Number. The OMB Control Number for this information collection is 0651-0033. Public burden for this form is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the information collection. Send comments regarding this burden estimate or any other aspect of this information collection, including suggestions for reducing this burden to the Chief Administrative Officer, United States Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450 or email InformationCollection@uspto.gov. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. If filing this completed form by mail, send to: **Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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# EXHIBIT H

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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 16/356,870 | 03/18/2019 | Michael Edward Klicpera | 70991.01 | 3033 |

22509 7590 09/25/2024

Patent Technology, Inc.
Michael Edward Klicpera
PO BOX 4750
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| EXAMINER | |
|---|---|
| HAILE, BENYAM | |

| ART UNIT | PAPER NUMBER |
|---|---|
| 2688 | |

| NOTIFICATION DATE | DELIVERY MODE |
|---|---|
| 09/25/2024 | ELECTRONIC |

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Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Patent No.: 11549837
Issue Date: 01/10/2023
Appl. No.: 16/356,870
Filed: 03/18/2019

## PART (A) RESPONSE FOR CERTIFICATES OF CORRECTION

This is a decision on the Certificate of Correction request filed 16 September 2024.

The request for issuance of Certificate of Correction for the above-identified correction(s) under the provisions of 37 CFR 1.322 and/or 1.323 is hereby:

(Check one)
☑ Approved ☐ Approved in Part ☐ Denied

Comments: ____

## PART (B) PETITION UNDER 37 CFR 1.324 OR 37 CFR 1.48

☐ This is a decision on the petition filed ____ to correct inventorship under 37 CFR 1.324.

☐ This is a decision on the request under 37 CFR 1.48, petition filed ____. In view of the fact that the patent has already issued, the request under 37 CFR 1.48 has been treated as a petition to correct inventorship under 37 CFR 1.324.

The petition is hereby: ☐ Granted ☐ Dismissed

Comment: ____

The patented filed is being forwarded to Certificate of Corrections Branch for issuance of a certificate naming only the actual inventor or inventors.

/STEVEN LIM/
Supervisory Patent Examiner, Art Unit 2688
Technology Center 2600
Phone: (571)270-1210

# EXHIBIT I

UNITED STATES PATENT AND TRADEMARK OFFICE

# CERTIFICATE OF CORRECTION



PATENT NO. : 11,549,837 B2
APPLICATION NO. : 16/356870
DATED : January 10, 2023
INVENTOR(S) : Michael Kliepera

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

In the Specification

Replace Column 1, Lines 26-39 as follows:

Water is increasingly becoming a precious resource. While freshwater supplies have been challenged due to climate (short rainy seasons and long droughts) and increased pollution, water demand has been rising due to the growing population along with increased development. The increasingly limited supply of fresh water is a humanitarian concern and water conservation is becoming a major issue for many communities. An apparatus for real-time monitoring of water use and real-time detection of leak conditions at private and/or public property(ies) (e.g., residential structures and yards, business/industrial/commercial facilities, and utilities/governmental/institutional sites) can be useful in assessing and controlling water resources and supporting water conservation.

Replace Column 7, Lines 13-18 as follows:

In the water meter environment, non-repudiation refers to the technology that confirms or ensures and prevents a sender or receiver from denying that a message(s), control/command signal(s), data, and/or information was sent or received. Blockchain technology is an upcoming technology that will ensure non-repudiation compliance.

Replace Column 23, Lines 20-46 as follows:

In the water meter environment, non-repudiation refers to the technology that confirms or ensures and prevents a sender or receiver from denying that a message(s), control/command signal(s), data, and/or information was sent or received. Blockchain technology is an upcoming technology that will ensure non-repudiation compliance.

Replace Column 25, Lines 28-58 as follows:

Several current security techniques that utilize public key cryptography are the Public Key Infrastructure (PKI), the Public Key Encryption (PKE) and the Digital Signature protocols. PKI enables digital certificates to be used to electronically identify an individual or an organization. A PKI requires a certificate authority (CA) that issues and verifies digital certificates and can utilize a registration authority (RA) that acts as the verifier of the CA when a new digital certificate is issued.

Signed and Sealed this
Fifteenth Day of October, 2024

Katherine Kelly Vidal

Katherine Kelly Vidal
Director of the United States Patent and Trademark Office

PKE is a message or command signal that is encrypted with a recipient's public key. The message cannot be decrypted by any individual or machine that does not possess the matching private key. PKE is a security protocol that is used to maintain confidentiality. Similarly, Digital signatures are also utilized with key pair technology, in association with authentication, integrity and non-repudiation confidentiality techniques. In practice, when a user transmits a message or signal or data with a digital signature, the message or signal includes a one-way hash prior to transmission, and the recipient uses the sender's public key to decrypt the hash and verify the digital signature. PKI, PKE, and digital signers are currently being supplemented with two factor authentication that utilizes a confirmation protocol after password input with a follow up email, phone call, or utilizing a authenticator number scheme. Furthermore, the PKI, PKE and digital signature techniques might become archaic when blockchain technology becomes more generally adopted.

Replace Column 26, Lines 23-40 as follows:
Encryption, authentication, integrity and non-repudiation or blockchain may be important characteristics when the water meter and leak detection system 10 (126 shown in FIGS. 6 and 200 shown in FIG. 7) is transferring water use or water quality data or information to a remote server/database via a public or private network that provide wireless subsequent access to registered computers and cell, smart and mobile phones 400. When the water mater and leak detection system 10 (126 shown in FIGS. 6 and 200 shown in FIG. 7) receives or uploads data and information such as a control command signal to send or transmit data and information it is critical that the device can authenticate the sender and be sure of the integrity of the data and information. Encryption provides privacy by converting the data or information into an "encrypted" code to prevent unauthorized access. Encryption can be provided point-to-point, or end-to-end, and transmit messages using encryption schemes such as Pretty Good Privacy (PGP), Secure/Multipurpose Internet E mail (S/MIME), XML, or SSL encryption protocols. Non-repudiation prevents the sender from denying that they sent or received data/information or a message. Non-repudiation can be provided by signing, electronic witnessing and technologies that assert a document was read before it was signed. One of the main advantages of the blockchain technology is that non-repudiation is nearly immutable. Here, the water meter and leak detection system 10 (126 shown in FIGS. 6 and 200 shown in FIG. 7) can include digital signature technology, data packets or messages using PGP, S/MIE, XML and Digital Signature, TLS/SSL and two-step authentication to provide for non-repudiation of those messages, information or data.

Replace Column 44, Lines 46-58 as follows:
FIG. 11 shows an example of an application or page (APP) 300 for Water Use 302 having a daily 304 graph 306 with day hours 308, designated by the symbol AM 312 and the night hours 310 designated by the symbol PM 314. At the right side of the example application or page (APP) 300 is the daily total use of water 316 and the daily total cost in dollars (or other currency) 318 the weekly total use of water 326 and the weekly total cost in dollars 328, and the monthly total use of water 336 and the monthly total cost in dollars 338 by year 334 per regional water rates that has been downloaded the data 340 from the registered or serving water municipality. Within the daily graph 306 is a plotted Line 307 that shows the hourly water use. The plotted Line 307 can have a rolling feature whereby new data replaces the oldest data in the graph. A gallon or liter scale can be included on the left side of the daily graph 305 (not shown).

In the Claims

Replace Column 60, Line 1-Column 62, Lines 1-46 as follows:

42. A water meter and leak detection system comprising:

a base station having a water control valve mechanism interposed between a main water source and a water supply line for a building or a structure;

the base station further comprising:

a) an electrical circuitry including at least one of a CPU, a microprocessor, or a microcontroller, or any combination thereof;

b) one or more flow rate sensors connected to the water supply line and designed to monitor at least one of a water use data, a water energy use data, a water quality data, or a leak detection information, or any combination thereof, from the building or the structure, the one or more flow rate sensors connected with the electrical circuitry;

c) a power source that is at least one of an AC powered, a DC powered, or a one or more standard or rechargeable batteries, or any combination thereof, the rechargeable batteries capable of being supplemented with a turbine or other rotational mechanism that generates electrical energy, the power source is electrically connected to the electrical circuitry;

d) one or more wireless communication technologies comprising at least one of a LoRa, a Sigfox, an Ultra Narrow Band (UNB), a 6LoWPAN, a WiMAX, a NB-IoT, a 3GPP cellular, a 4G/LTE-M cellular, or a 5G cellular technology, or any combination thereof;

e) wherein the one or more wireless communication technologies utilizes authentication and encryption technologies for pairing operations and to prevent unauthorized access to a water data or information; and

f) wherein the one or more wireless communication technologies comprising at least one of the LoRa, the Sigfox, the Ultra Narrow Band (UNB), the 6LoWPAN, the WiMAX, the NB-IoT, the 3GPP cellular, the 4G/LTE-M cellular, or the 5G cellular technology, or any combination thereof, consists of a duplex technology to transmit the water use data, the water energy use data, the water quality data, or the leak detection information, or any combination thereof, and send commands to regulate the water control valve mechanism;

the CPU, the microprocessor, or the microcontroller, or any combination thereof, includes at least one of a programming setting managed by a user to remotely set a mode setting or modify a default setting processed by a manufacturer to:

a) record a water flow event to an integrated memory bank or a removable memory device for analysis;

b) combine a plurality of water flow events into the integrated memory bank and subsequently schedule the transfer of the water flow events to a one or more remote computers or servers or to a cloud computing company;

c) transfer the water flow event to the one or more remote computers or servers or to the cloud computing company;

d) transfer the water data or information utilizing a blockchain technology to the one or more remote computers or servers or to the cloud computing company;

e) modify water units or timing units;

f) establish alarm set points;

or any combination thereof; and

the one or more wireless communication technologies configured to:

(i) transmit at least one of the water use data, the water energy use data, the water quality data, or the leak detection information, or any combination thereof, to the one or more remote computers or servers or to the cloud computing company; and

(ii) receive an instruction or signal to command the management of the water control valve mechanism or perform another command operation;

using at least one of an Internet connection, a private network system, or a corporate owned network system that communicates with a smart phone, a computer, a server, a tablet, a web portal, or another electronic communication device.

43. A water meter and leak detection system as recited in claim 42, further comprising a temperature sensor in close proximity to the water supply line, the temperature sensor communicates with the water meter and leak detection system and initiates a water freezing protection procedure when the water supply line approaches a water freezing point of 32 degrees Fahrenheit or 0 degrees Celsius, the freezing protection procedure includes at least one of incorporating a freeze plug mechanism, draining water distribution lines with a three-way valve, or replacing water in the water supply line with an air, a nitrogen, or another gas or a liquid with low freezing point.

44. A water meter and leak detection system as recited in claim 42, further comprising at least one of a pressure sensor or an acoustic sensor configurable to quantify a leak condition when the water meter and leak detection system closes the water control valve mechanism by monitoring pressure changes and capable of transferring monitored pressure or acoustic information to the base station for making a one or more software calculations to determine a leak type or a leak category.

45. A water meter and leak detection system as recited in claim 42, further comprising one or more communication hubs in wired communication with the base station or having a wireless communication technology corresponding with the one or more wireless communication technologies of the base station, wherein the one or more communication hubs transfers the water use data, the water energy use data, the water quality data, or the leak detection information, or any combination thereof, to at least one of the Internet connection, the private network system, or the corporate owned network system that communicates with company the one or more remote computers or servers or with the cloud computing company.

46. A water meter and leak detection system as recited in claim 42, further comprising a second wireless communication technology utilizing at least of one of a Bluetooth, a Bluetooth low energy, or a Wi-Fi wireless technology for performing an authentication pairing procedure to initially establish remote wireless communications by inputting a network username and a password, scanning a QR code, or performing a two-step authentication scheme, or any combination thereof.

47. A water meter and leak detection system as recited in claim 42, wherein an owner or the user communicates with at least one of the smart phone, the computer, the server, the tablet, the web portal, or the other electronic communication device that includes a software program displaying an icon, a menu, or a submenu that provides at least one function of:

(a) providing a graphical display of at least one of the water use data, the water energy use data, or the water quality data, or any combination thereof, from a selected water fixture or a water appliance, the water data or information transferred from at least one of the base station, a remote central computer, or the cloud computing company;

(b) displaying an alarm condition based on one of the water use data, the water energy use data, or the water quality data, or any combination thereof, and programmed into the base station;

(c) turning on or off a water supply by sending a command signal to the base station;

(d) showing or modifying the software program, a setting, or a default menu included within the base station;

(e) identifying an operational position of the water control valve mechanism by sending a request to the base station;

(f) downloading updates or regional water rates into the base station; or

(g) programming a vacation or work water schedule into the base station.

48. A water meter and leak detection system as recited in claim 45, wherein the base station includes at least one of a mesh or a peer-to-peer technology circuitry that communicates with a one or more base stations or the one or more communication hubs.

49. A water meter and leak detection system as recited in claim 45, wherein the one or more communication hubs includes at least one of a mesh or a peer-to-peer technology circuitry that communicates with a one or more base stations.

50. A water meter and leak detection system as recited in claim 42, further comprising a one or more wired communication technology comprising at least one of a an X10, an UPB, or a HART technology.

51. A water meter and leak detection system as recited in claim 42, wherein the one or more wireless communication technologies transfers to the Internet, the water use data, the water energy use data, the water quality data, or the leak detection information, or any combination thereof, and transmits a control signal utilizing the blockchain technology.

# EXHIBIT J

**IN THE UNITED STATES DISTRICT COURT FOR THE DISTRICT OF DELAWARE**

**REIN TECH, INC.,**
**Plaintiff,**
**v.**
**MUELLER SYSTEMS, LLC,**
**Defendant.**

**No. 1:18-cv-01683-MN**

# AFFIDAVIT UNDER FEDERAL RULES OF EVIDENCE CODE §701

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## I. INTRODUCTION

Plaintiff Rein Tech, Inc. (Rein Tech) respectfully submits this layman's Affidavit pursuant to *Federal Rule of Evidence 701 Opinion Testimony by Lay Witness*. Federal Rule of Evidence 701 permits a witness

not testifying as an expert to submit Affidavits if the testimony is: "(a) rationally based on the witness's perception, (b) helpful to clearly understand the witness's testimony or to determine a fact in issue, and (c) not based on scientific, technical or other specialized knowledge within the scope of Rule 702 [Testimony by Expert Witnesses]." Plaintiff also has considerable knowledge, skill, experience, training, and education about the subject matter by working with Rein Tech engineers and conducting ten home test studies of wireless water meter technology applications.

## II. STATEMENT OF FACTS

| US. Patent No. | Asserted Claim(s) |
|---|---|
| 11,549,837 | 42, 44, 45, 47, 48, 49 |

1) Michael E. Klicpera is the inventor of U.S. Patent No. 11.549.837 which is being enforced in the current litigation.
2) Patent Application 16/356,870 clearly disclosed and claimed a water meter and network for LoRa and cellular wireless technology. After the USPTO issued U.S. Patent No. 11,549,837 (the "837 Patent") based on Application 16/356,870, the '837 Patent was assigned to Rein Tech. On March 10, 2023, Rein Tech added this patent to this case by filing a Second Amended Complaint (D.I. 91 at 9-10) against Defendant, whose

wireless water meter utilizes LoRa technology. Based on Plaintiff's claim charts submitted with the original Complaint (D.I. 1), the First Amended Complaint (D.I. 81), and the Second Amended Complaint (D.I. 91 ), details Defendant's infringement of the above cited Patent. The plaintiff asserts that Defendant continues to practice the technology disclosed in Rein Tech's Patent-in-Suit.

3) On October 10, 2024, the USPTO granted and published a Certificate of Correction (USPTO downloaded copy provided in Exhibit 1). This Certificate of Correction addresses the Dedendant's Invalidity Contention which is the primary defense propounded by the Defendant. The Defendant's lawyers never contended that the Defendant did not infringe the patent.

**A. DEFENDANT WITHHELD CRITICAL EVIDENCE DURING DISCOVERY**

The Plaintiff served Defendant with Interrogatories on June 1, 2023 (*see* D.I. 103), and with a first Request for Production of Documents (1-5) on June 29, 2023.

On July 3, 2023, Defendant responded to Rein Tech's Interrogatories. (*Id.*, Ex. 2; *see also* D.I. 112.) Defendant's responses to Interrogatory Nos. 2, 4, 5, and 8 admitted that Mueller, since 2018, had installed its water meters with wireless technology at four sites (two pilot cellular and two

LoRaWAN installations). (*Id.*, Ex. 2, No. 2.) Mueller further admitted that its network system (Mi.Net and backend software)-includes collectors and/or repeaters (communication hubs) that use a LoRa, cellular or internet connection to an Amazon Web Server (AWS) server, that executes a specialized API and the Sentryx™ server. (*Id.*, Ex. 2, Nos. 2, 4, 5, and 8.) Mueller's responses to the Interrogatories did not disclose critical information including the location of the sites, the number of water meters installed, and any profits or revenue as requested by Plaintiff (Id., Ex.2, Nos. 2 and 19).[1] The responses further did not identify the individual(s) from Mueller who answered the interrogatory questions as required under *Federal Rule of Civil Procedure 33.*

Defendant Mueller withheld information requested by Plaintiff's Interrogatories 1 through 25. For example, Rein Tech's Interrogatory No. 2 requested the Defendant to "Describe the number of LoRa and Cellular installations for contracted projects with third parties using the accused products since 2018." Defendant responded:

> Mueller objects to this Interrogatory to the extent it seeks information that is protected by the attorney-client privilege and/or by the work product immunity. Based on its objections and understanding of the Interrogatory, Mueller states that since 2018, it has approximately two pilot cellular installations and two LoRaWAN installations. Mueller's

[1] Nor did Defendant provide documents in response to Rein Tech's first request for Production of Documents and Mueller completely ignored Rein Tech's second request for Production of Documents.

> response to this Interrogatory is made based on present knowledge, and its investigation and review of documents is ongoing. Mueller reserves the right to supplement and/or change its response as discovery and the case progress. (Ex. 8, No. 2)

Rein Tech's Interrogatory No. 19 requested a description of Mueller's historical market share, sales volume, pricing, revenues, costs, profits, profit margins, and cash flows relating to the accused products. However, Mueller did not provide the requested information and responded as shown below.

> Mueller objects to this Interrogatory to the extent it seeks information that is protected by the attorney-client privilege and/or by the work product immunity. Mueller further objects to this Interrogatory as overly broad and unduly burdensome as it seeks information not relevant to the subject matter involved in this litigation nor proportional to the needs of the case. Subject to and without waiving its objections, Mueller responds as follows:
>
> Mueller has not yet completed its investigation and review of documents regarding this Interrogatory. Based on its objections and understanding of the Interrogatory, Mueller will identify relevant documents for the accused products, if such documents exist, and reserves the right to produce documents pursuant to Rule 33(d). Mueller also reserves the right to supplement and/or change its response to this Interrogatory as discovery and the case progress. (*Id.*, Ex. 8, No. 19)

Mueller stated that they "reserve the right to supplement and/or change its response as discovery and the case progress" or "object[s] to this Interrogatory to the extent is seeks information that is work product immunity". However, Mueller neither provided supplemental responses nor

provided documents supporting disclosures in the Defendant's response to the Plaintiff's Interrogatories.

The Defendant did not provide relevant, responsive documents in reply to Plaintiff's first Request for Production of Documents (1-5), submitted to Defendant on May 31, 2023 (*see* D.I. 102). Defendant's response, dated June 29, 2023, objected to all requests and produced no documents. (*Id.* Ex. 3). Subsequently, Mueller's attorney sent an email on July 31, 2023 (Ex. 4) to Rein Tech's previous counsel stating:

> Based on our investigation, which is ongoing, it is our understanding at present that none of Mueller's LoRaWAN and Cellular Node installations to date involve combinations with 420 RDMs and, as such, quarterly and annual gross and net sales in U.S. dollars and quantities sold in and from the United States for the accused products from October 27, 2021, to present: as requested in Document Request No. 2. is $0 for all requested categories, with no responsive documents to produce." (*Id.*, Ex. 4.)

Rein Tech's previous counsel was extremely dissatisfied with Mueller's failure to produce any documents and responded to Mueller's July 31, 2023, email (and the "spreadsheet compiling associated financial information" provided via Mueller's ShareFile link). In an email dated September 10, 2023, Rein Tech's previous counsel informed Mueller's attorney that:

> Further regarding your email below from July 31, you say that to date Mueller hasn't sold and/or installed any 420

> RDMs with a LoRaWAN or Cellular Nodes, so that Mueller's sales of these components is $0. This makes no sense. Rein Tech has provided exhibits in its first and second amended complaint and its initial and final infringement contentions showing the 420 RDM is designed to be packaged with either a LoRaWAN or Cellular Node. The 420 RDM is useless without one of these nodes. It cannot communicate with Mueller's Mi.Net network and Sentryx servers without them. Rein Tech's initial and final infringement contentions make this clear. Mueller's answers to interrogatories nos. 4, 5, and 8 also make this clear. *(emphasis added)* (*Id.,* Ex. 4.).

Defendant's email response regarding Plaintiff's first Request for Production of Documents referred only to the 420 RDM water meter with a LoRaWAN or Cellular node and denied any installation or sales of the accused products (*Id.*, Ex. 4). This contradicts their previous responses to Interrogatory Nos. 2, 4, 5, and 8 where Mueller admitted to two LoRa and two cellular water meter installation sites, with communication hubs (collectors and/or repeaters) that use a cellular or internet connection to an AWS server utilizing a specialized API (Sentryx™) (Ex. 2). In addition, the wireless water meters that Mueller's installed, by its own admission, s at four sites, would certainly generate sales. The furnishing of such sales information was elicited specifically and required by the first Request for Production of Documents No. 2 (Ex. 3.). Yet, the Defendant produced no documents either responsive or nonresponsive.

On September 10, 2023, Plaintiff served Defendant with the more

detailed second Request for Production of Documents (6-15) (Ex. 6), which was due on October 10, 2023. (*Id.*, Ex. 6.) Rein Tech's previous counsel also sent an email with an attached letter, dated September 14, 2023, to Mueller's attorney (Ex. 7) and presented Defendant with twenty-three discovery deficiencies. (*See, e.g.*, *Id.*, Ex. 7.)[2] Defendant never responded to the second Request for Production of Documents nor to the letter by Plaintiff's previous counsel.

Instead, Defendant completely ignored the second Request for Production of Documents and, within two weeks after the due date for their response, initiated settlement negotiations and offered an unaccepted Settlement Agreement.

## B. PLAINTIFF'S OWN DISCOVERY YIELDED FINDINGS THAT CONTRADICT DEFENDANT'S REPLY TO THE REQUESTS FOR PRODUCTION OF DOCUMENTS AND EMAIL COMMUNICATIONS

[2] In contrast, Plaintiff responded to Defendant's Interrogatories and Request for Production of Documents, providing emails from Rein Tech's engineering team; engineering drawings; disclosure book pages, and other relevant documentation; and actual water meter test products used in the residential field study including communications hubs. (*See* D.I. 114.)

Upon viewing Mueller's own website, Rein Tech became aware that Defendant installed wireless water meters at the following sites: Florence, Arizona; San Diego, California; Fort Myers/Lee County, Florida; and Sheridan, Wyoming.

Because of Defendant's deficient discovery responses, Rein Tech retained a Research Attorney who conducted an independent investigation of public and governmental sources that, to date, has identified at least five additional sites where Defendant installed wireless water meters during the time-period the '837 patent was enforceable. The five independently identified sites are: Newport Beach, California. ( Ex. 8.1-8.3), Santa Rosa County, Florida ( Ex. 9.1-9.4); Calaveras County, California ( Ex. 10); South Daytona, Florida ( Ex. 11); and West Slope, Oregon ( Exhibit 12.1-12.2). The independent investigation was limited to publicly available sources. Rein Tech's knowledge gained through its own investigation does not excuse Defendant's discovery deficiencies. Defendant failed to disclose and did not provide any documentation about the five geographically dispersed sites, nor the seven-hundred and fifty thousand (750,000) Mueller 420 RDM that the Sales Manager stated have been deployed, sold, and are in operation, in the U.S. (See discussion regarding a Mueller Sales Manager's remarks at pages 13 and 14 *infra.*) Furthermore, Mueller may have manufactured the Mueller 420 RDM in the United States and deployed or sold water meters in

operation in the international market. Thus, Defendant's negative responses show that Mueller withheld critical evidence in responding to Rein Tech's discovery requests. And further, the relevant publicly available information that was discovered solely by the efforts of Plaintiff may be limited and incomplete.

As noted above, pursuant to Rein Tech's independent investigation, Rein Tech discovered specific sites where Mueller's 420 RDM (or equivalent) water meters have been installed and are in operations.

The Research Attorney found publicly available evidence that Mueller installed wireless water meters in **Newport Beach, California (Exhibit 8).**

> **Document 1 (Exhibit 8.1)** *Water Online* news article, source: Mueller Water Products, Mueller Awarded Contract for AMI Development in Newport Beach, CA, October 21, 2020. Statement: "The Mi.Net AMI system uses a LoRa-enabled radio device that is attached to the newly installed meter and digital register to transmit water usage information over a secure network. The new system will leverage the Sentryx™ water intelligence software platform which is easy to use and gives water utilities access to accurate water usage information, near real-time alerts and provides data to the City's water billing system. The City will also have the capability to provide hourly water usage information to customers."
>
> **Document 2 (Exhibit 8.2)** City of Newport Beach, City Council Staff Report, Advanced (Water) Meter Infrastructure Project, Approval of Initial Proof of Performance Purchase and Installation Agreement, Project 19W12, January 22, 2019. Statement: "The Utilities and Finance Departments recommend that the City move forward with an Advanced Meter Infrastructure (AMI) Project on its water meters. The

proposed AMI project would install new "smart meters" which will provide automation and improved customer service and response. The departments have procured Mueller LLC as the preferred vendor through an RFP process and now recommend approval of the initial "Proof of Performance" phase of project." **[page 15-2, PDF page 2]:** Mueller Systems, LLC ranked number 1 with an overall score of 87.58 by the evaluation panel in the Request for Proposal process; **[pages 15-21, PDF page 21]:** 4.1 Network Equipment; 4.2 Meter and MiNode**;** 5. AMI Software Integration- Mi Host 6. AMI Software Integration- Consumer Portal; **[pages 15-24 to 15-35, PDF pages 24-35]:** 4.1 Network Equipment; 4.2 Meter and MiNode**; [page 15-36, PDF page 36]:** 5. AMI Software Integration- Mi Host; **[page 15-36, page, PDF page 36]:** 6. AMI Software Integration- Consumer Portal; **[page 15-42, PDF page 42]:** XR-R Mi.Hub Collector (on Radio Tower), XR Mi.HUB (on lift station and street lights), AC XR Repeaters (on Street Lights); **[page 15-61, PDF page 61]:** Consumer Portal Integration Plan, Mueller Mi.Hosts => Newport Beach Consumer Portal Interface; **[page 15-65, PDF page 65]:** 1. All Mi.Nodes and meters physically installed, 2. Network infrastructure installed, 3. All Nodes have been configured for reporting.

**Document 3 (Exhibit 8.3)** AMENDMENT NO. ONE TO PURCHASE, INSTALLATION, AND MAINTENANCE AGREEMENT WITH MUELLER SYSTEMS, LLC FOR AUTOMATED METER INFRASTRUCTURE FOR CITY WATER METERS. Information **[PDF page 1]:** On May 25, 2023, the City of Newport Beach awarded to Mueller Systems, LLC an agreement to furnish, install, and maintain an Automated Meter Infrastructure (AMI) solution as detailed in the Scope of Work of Exhibit A of the Agreement, consisting of approximately twenty-six thousand six-hundred and eighty (26,680) Mueller wireless water meters for a sum of eight-million one-hundred and fifty thousand dollars ($8,150,000); **[PDF page 5]:** Contractor's compensation for all Work performed in accordance with this Agreement, including all reimbursable items, subcontractor fees, for a base contract amount of Seven Million Eight Hundred Thirty Seven Thousand One Hundred Seventy Three Dollars

and 14/100 ($7,837,173.14), and 2% allocation for bonding in the amount of One Hundred Fifty Six Thousand Seven Hundred Forty Three Dollars and 46/100 ($156,743.46), and a 2% contingency in the amount of One Hundred Fifty Six Thousand Eighty Three Dollars and 40/100 ($156,083.40), which shall not exceed Eight Million One Hundred Fifty Thousand Dollars and 00/100 ($8,150,000.00); **[PDF page 20]**: Network Equipment, Meter Mi Host, AMI software Integration. Mi.Host and Consumer Portal **[PDF page 22]:** Basic AMI • Utility User Interface, • List of Installed meters with last uploaded reading, • Deployment wide consumption graph, • Meter Details page for each meter, • Basic Graphing of Consumer Consumption, • Customer Information (Automatically Imported as Read only), • Account Management (Read only - imported from existing billing system), • Hourly readings on all meters; **[PDF page 23)]:** 4.1. Network Equipment A preliminary network design has been completed based on the inputs provided to Mueller Systems and is attached as Attachment 1. Mueller Systems will conduct final site surveys and develop a Final Network Design following contract execution. Both parties will review network design inclusive of locations, assumptions, etc. prior to installation of network equipment. If any City assets are needed, City approvals will be requested, and the design adjusted accordingly. Mueller Systems will request City approval of the Final Network Design if any City assets are required for coverage. Mueller Systems will complete the installation of all required Collectors and ancillary equipment no later than 90 days from Effective Date for locations where Data Collectors have been sited. Descriptions of the proposed sites, equipment, and placements are in the Propagation Study are in Attachment 1. The installed network will be tested for coverage as part of the Project 4.2. Meter and MiNode Meters and MiNode equipment will be installed by Mueller Systems subcontractor and will be managed by the Mueller Systems project team. Mueller Systems will provide training for installation teams on the use of MiNet specific installation tools and procedures; **[PDF pages 34-65]:** 5. AMI Software Integration - Mi.Host 6. AMI Software Integration - Consumer Portal with Smart Energy Water 7. Mueller Systems' Responsibilities, Coordinate

> Project Communications and Status Updates. • Install Mi.Net Infrastructure. • Provide Mi.Host Server Hosting - Mueller Systems will host the server for Mi.Net AMI server. • Mi.Node installations will be completed by Mueller Systems subcontractor.**[PDF page 65]:** Models 400 and 500 Series Meters, Solid State Meters; **[PDF page 78]:** RLI Insurance Company duly authorized to transact business under the laws of the State of California, as Surety (referred to as "Surety") are held and bound unto the City of Newport Beach, in the sum of Eight Million One Hundred Fifty Thousand Dollars and 00/100 ($8,150,000.00); **[PDF page 83]:** RLI Insurance Company duly authorized to transact business under the laws of the State of California, as Surety (referred to as "Surety") are held and bound unto the City of Newport Beach, in the sum of Eight Million One Hundred Fifty Thousand Dollars and 00/100 ($8,150,000.00).

**Mueller did not disclose the installation, use, or profit/revenue associated with their wireless water meters in Newport Beach, California, in response to Rein Tech's Request for Production of Documents and Interrogatories.**

The Research Attorney found publicly available evidence that Mueller installed wireless water meters in **Northwest Florida/Santa Rosa County, Florida (Exhibit 9).**

> **Document 1 (Exhibit 9.1)** *Water Online* news article, Pace Water System Improves Management Of Its Water Infrastructure With Mueller Systems' AMI Network, April 27, 2017. Statement: "Mueller Systems' AMI system and remote disconnect meters are proving to be tremendous assets in helping us manage our water system more efficiently and better serve our customers … Pace Water System is also installing more than 1,000 of Mueller Systems' 420 Remote Disconnect Meters (RDMs), which enable the utility to manage water service remotely rather than at the point of service. The two-way Mi.Net AMI system connects meters, leak detection sensors and control devices into an efficient wireless network. With

Mueller Systems' advanced RDMs, Pace Water Systems can reduce the number of utility truck rolls and enhance customer service for the arge population of seasonal residence in the utility's northwest Florida service area."

**Document 2 (Exhibit 9.2)** *Water Finance and Management* article, Florida water system, Mueller to launch meter customer service pilot program, March 28, 2022. Statement: "Mueller Systems has been selected by Pace Water System in Santa Rosa County, Florida, to deploy a pilot program for their water meter system which includes new features that allow customers to control their meter from a mobile phone. The pilot program is underway and is expected to include 350 customers, with completion of the program at the end of this month."

**Document 3 (Exhibit 9.3)** Mueller *Innovation News,* Mueller Deploys Smart Customer IoT Product in Santa Rosa County, Florida, March 2022, (http://marketing.muellerwp.com/mueller-innovation-news-march-2022). Statement: "Mueller Systems has been selected by Pace Water System in Santa Rosa County, Florida to deploy a pilot program for their water meter system which include new features that allow customers to control their meter from a mobile phone. The pilot program is underway and is expected to include 350 customers, with completion of the program at the end of this month."

**Document 4 (Exhibit 9.4)** *Water Online* news article: Mueller Deploys Smart Customer IoT Product In Santa Rosa County, FL, March 25, 2022. Statements: "Mueller Systems has been selected by Pace Water System in Santa Rosa County, Florida, to deploy a pilot program for their water meter system which includes new features that allow customers to control their meter from a mobile phone. The pilot program is underway and is expected to include 350 customers, with completion of the program at the end of this month. …The integration uses Mueller's Sentryx API (Application Programming Interface) to integrate the existing system with a customer-facing mobile app from Dropcount, a cloud-based data analytics and

customer engagement application for water utilities. Customers who opt-in can see their hourly water usage and turn their water on or off from their phone. This app will give customers the ability to remotely control the water supply to their house."

**Mueller did not disclose the installation, use, or profit/revenue associated with their wireless water meters in Santa Rosa County, Florida, in response to Rein Tech's Request for Production of Documents and Interrogatories.**

The Research Attorney found publicly available evidence that Mueller installed wireless water meters in **Calaveras County, California (Exhibit 10).**

**Document 1** *Water Online* news article, source: Mueller Water Products, Mueller Awarded Contract For AMI Deployment in Calaveras County, CA, March 9, 2021. Statement: "Mueller Systems today announced that Calaveras County Water District has selected Mueller Systems to deploy an advanced metering infrastructure (AMI) network covering 1,000 with 13,000 AMI endpoints. …The project will provide new state-of-the-art metering technology to the area, allowing Calaveras County to capture hourly meter readings in near real-time and provide accurate data to the District's water billing system. The Sentryx™ software enabled Mi.Net AMI system uses a LoRa® enabled radio device that is attached to the newly installed meter and digital register to transmit water usage information over a secure network. The Sentryx water intelligence platform provides analytical data and insights, enabling water utilities to make informed strategic and day-to-day operational decisions. The new endpoints are also capable of identifying potential leaks and allowing customers to view their water usage, better manage consumption and conserve water."

**Mueller did not disclose the installation, use, or profit/revenue associated with their wireless water meters in Calaveras County,**

**California, in response to Rein Tech's Request for Production of Documents and Interrogatories.**

The Research Attorney found publicly available evidence that Mueller installed wireless water meters in **South Daytona, Florida (Exhibit 11).**

> **Document 1** *Informed Infrastructure* news article: South Daytona brings efficiency, accuracy, and safety to water usage with Mueller Systems NaaS AMI System with LoRaWAN, accessed Jan 14, 2024. Statements: "Today Mueller Systems, LLC announced that the City of South Daytona, Florida, will soon begin deployment of the Mueller Systems' Network as a Service (NaaS) AMI System with LoRaWAN. The LoRaWAN endpoints will efficiently collect data remotely and provide South Daytona with visibility into its customers' water consumption. …The Mi.Net® node with LoRaWAN is a bi-directional endpoint capable of transmitting secure data to and from the network server within seconds. At this unprecedented speed of communication, on-demand reads can be requested and received without delay. Near real-time data is available to customer service and operations, which will help identify and resolve leaks or billing issues quicker. Each LoRa-based endpoint maintains the data in its non-volatile onboard memory and communicates with the Mueller Systems Mi.Net® Advanced Metering Infrastructure (AMI) system. This data backup feature helps to ensure that South Daytona's water utility is protected against any single point of failure. Alerts such as potential leaks, no flow, low flow, and register tampering are monitored by the Mueller Systems Network Operations Center to provide an added layer of security. Mueller Systems' NaaS offering means South Daytona does not have to worry about maintaining the network and can focus on customer service."

**Mueller did not disclose the installation, use, or profit/revenue associated with their wireless water meters in South Daytona, Florida, in response to Rein Tech's Request for Production of Documents and Interrogatories.**

The Research Attorney found publicly available evidence that Mueller installed wireless water meters in **West Slope, Oregon (Exhibit 12).**

> **Document 1 (Exhibit 12.1)** *Water World* article, AMR system boosts Oregon water district's meter reading speed, July 11, 2023. Statement (page 3): "These new Mueller Systems radios provide efficient, long-range two-way communication. LoRa -- short for long range -- is resistant to most interference in the 900 MHz band ensuring readings is reliable. This allows utilities to drive every other street and drive at the posted speed limit."
>
> **Document 2 (Exhibit 12.2)** Mueller's website content, Case Study: OREGON'S WEST SLOPE WATER DISTRICT EXPERIENCES 300% FASTER METER READINGS WITH MODULAR AMR SYSTEM, F14934 6/23. Statement (page 2): "The Mueller Systems AMR comes with EZ Reader™ Software – an easy-to-use local software that manages data collection for the entire route. The EZ Reader application is capable of interfacing with any billing system, including custom developed systems. This streamlines the process of data collection to data action, reducing the potential for human error from manual data entry."

**Mueller did not disclose the installation, use, or profit/revenue associated with their wireless water meters in West Slope, Oregon, in response to Rein Tech's Request for Production of Documents and Interrogatories.**

Rein Tech's investigation also confirmed, in a conversation with a Mueller Sales Manager, that Mueller's 420 RDM water meter is basically a Mueller Model 400 water meter with a control valve. The Mueller Sales Manager stated that the Model 400 water meter with control valve had a length of seven inches (7") and could facilitate use in a water meter box with

connectors. The Mueller Sales Manager also conveyed that they had ultrasonic water meters that have no moving parts in the water flow. The Mueller Sales Manager explained that Mueller has two models of water meter registers (SSR digital read and ME8 rolling dial) that can communicate with a wireless node (LoRa or cellular) for any Mueller water meter models (Mueller Solid State Register (SSR) and Mueller Encoder Eight (ME-8)). The Mueller Sales Manager also stated that, to date, seven-hundred and fifty thousand (750,000) Mueller 420 RDM water meters have been deployed, sold, and are in operation in the U.S. The Research Attorney may have been unable to locate public or nonpublic sites and information, and it may take months or years to independently locate the seven-hundred and fifty thousand (750,000) Mueller 420 RDM that were sold and are in operation in the United States, and to determine the income derived from these sales. Furthermore, this statement by the Mueller Sales Manage is supported by the February 5. 2025 10Q SEC Edgar Condensed Consolidated Statements of Operations (Exhibit 13) wherein *2023 Mueller Water Products* reported net sales of $256.4 million in 2023, and $304.3 million in 2024, with a gross profit of $86.5 million in 2023 which increased to $103.0 million in 2024. Damages for patent infringement for the 2023 and 2224 calendar years for net sales at 3%, a reasonable royalty, equate to $7,602,000 for 2023 and $9,129,000 for 2024 totaling $16,731,000. Alternately,

damages for patent infringement for the 2023 and 2224 calendar years for gross sales at 7%, a reasonable royalty, equate to 6,029,000 for 2023 and 7,210,000 for 2024 totaling to 13,239,000. The issued '837 Patent was enforceable as of January 10, 2023, and is applicable to February 5, 2025, 10Q SEC Edgar Condensed Consolidated Statements of Operations (Exhibit 13). This SEC document only accounts for 2 years of net sales or 2 years of gross sales. The subject '837 patent is enforceable until at least the year 2036, an additional 12 years.

The Defendants continued evasion of its obligation to provide discovery, taken in the context that Plaintiff found information about site installations through publicly available sources and information that was reported to and filed with the SEC by the Defendant, justifies sanctions to be imposed on the Defendant. In addition, the Court should compel the Defendant to compensate the Plaintiff for all costs associated with the Research Attorney who uncovered information that the Defendant evasively hid.

## C. DEFENDANT CONTINUES TO PRACTICE THE TECHNOLOGY DISCLOSED IN THE PATENT-IN-SUIT

Defendant continues to practice the claims of Rein Tech's Patents-in-Suit, and specifically the claims of the '837 Patent. In its original, first amended, and second amended Complaints, Plaintiff provided claims charts

that show-Mueller's wireless water meters practice and infringe the claims of Rein Tech's Patents-in-Suit. Mueller's responses to Interrogatories Nos. 2, 4, 5, and 8, Plaintiff's claim charts shown in the second Amended Complaint, initial and final Infringement Contentions, and independent research confirm that Mueller practices the claims of Rein Tech's Patents-in-Suit.

**II.** CONCLUSION

The Plaintiff and his prior litigation counsel were frustrated with the Defendant's failure to answer the Plaintiff's Requests for Documents and the non-responsive answers to Interrogatories especially the emailed claim that "Document Request No. 2. is $0 for all requested categories, with no responsive documents to produce." The Plaintiff's own research identified at least five sites that involve contracted- work by the Defendant to deploy water meters and to operate a wireless network that were performed during the discovery period. A Mueller Sales Manager also stated that, to date, seven-hundred and fifty thousand (750,000) Mueller 420 RDM water meters have been deployed, sold, and are in operation in the U.S. The SEC Edgar document produced in the Affidavit, in Exhibit 13, also contradicts the Defendant's assertation that zero money was generated where the net sales were reported at 7,602,000 for 2023 and 9,129,000 for 2024 and gross sales were at 6,029,000 for 2023 and 7,210,000 for 2024.

I declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct. Executed on February 18, 2025.

/Michael Klicpera/ February 18, 2025

Michael Klicpera

See attached
Jurat / Acknowledgment
JL 02/18/25

# CALIFORNIA ACKNOWLEDGMENT CERTIFICATE

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document, to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

State Of: **California**
County Of: Contra Costa

On February 18th, **2025** before me, **J. Labra,** Notary Public, personally appeared, Michael Klicpera
who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that she/he/they executed the same in her/his/their authorized capacity(ies), and that by her/his/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

**I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.**

**WITNESS my hand and official seal.**

J. LABRA
COMM. # 2388438
NOTARY PUBLIC • CALIFORNIA
SANTA CLARA COUNTY
MY COMMISSION EXPIRES
DECEMBER 27, 2025
JAS1 JAS1

Signature: **J. Labra**

**Title of Document:** Affidavit under Federal Rules of Evidence

**Total Number of Pages including Attachment:** 44 Code 701

**Notary Commission Expiration Date: December 27, 2025**

**Notary Commission Number: #2388438**

# EXHIBIT K

**IN THE UNITED STATES DISTRICT**

**COURT FOR THE DISTRICT OF DELAWARE**

| | |
|---|---|
| **REIN TECH, INC.,**<br>**Plaintiff**<br>**v.**<br>**MUELLER SYSTEMS, LLC,**<br>**Defendant** | **No. 1:18-cv-01683-MN** |

**PLANTIFF'S REBUTTAL TO OPENING EXPERT WITNESS REPORT BY JOSEPH PARADISO PH.D. REGARDING U.S. PATENT NO. 11,549,837**

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## 1. INTRODUCTION

Review of the Opening Expert Report, as detailed below, finds that Mr. Joseph Paradiso based his opening expert report on erroneous assumptions, applied faulty analyses, and made significant errors in his interpretation of USPTO rules and law. His reliance on fabricated procedure is so significant and severe that it calls into question his qualification as an expert witness.

(a) The U.S. Patent No. 11,549,837 ('837 Patent) Certificate of Correction was approved and published on October 15, 2024 (Exhibit A). This Certificate of Correction was completely ignored in Joseph Paradiso's expert witness report dated February 18, 2025, more than four months after the date of the Certificate of Correction. Thus, Joseph Paradiso, the expert witness, chose to use, or was instructed to use, an outdated version of claims for his analysis of the '837 Patent. The Defendant knew, or should have known, that the Certificate of Correction defines the current and correct set of claims and specification of the '837 Patent. If Defendant Mueller intentionally instructed the expert witness to use the outdated set of claims and specification, the Defendant introduced unfounded bias against Plaintiff's valid claims and specification of the '837 Patent.

(b) Joseph Paradiso's remarks show that he does not know or understand the definition of and requirements for a USPTO Continuation-in-Part (CIP). Joseph Paradiso employs false assumptions to support his conclusion, "In my opinion, the disclosures in the priority applications fail to reasonably convey to a POSA that the inventor had possession..." (*Emphasis added.*) He then lists elements or limitations and challenged priority in paragraphs 47-49, 50-51, and 53-55. Mr. Paradiso's conclusory statement is preposterous and absurd because he is completely unaware of the research and discussions of Rein Tech's inventor and Rein Tech's electrical and software engineers.

(c) Joseph Paradiso apparently does not understand important USPTO policy and rules applicable to CIPs. The '837 Patent is a CIP of U.S. Patent Application Ser. No. 15/016,178 filed on February 4, 2016, which is U.S. Parent Publication No. 2016-0163177 A1 ('177 Reference), which became issued Patent 10,410,501 ('501 Patent). The '501 Patent specification is incorporated by reference into the '837 patent in its entirety. However, Joseph Paradiso wrongly concludes, in contradiction to USPTO law, that "The Asserted Claims are Anticipated by U.S Parent Publication No. 2016-016377 A1 to Klicpera ("Klicpera")" and wrongly applies the '177 Reference as prior art.

Clearly, U.S. Pat. Pub. No. 2016-0163177 Al ('177 Reference) is not valid prior art to the '837 Patent under the exception defined in 35 U.S.C. § 102(b)(2), which states:

> Disclosures appearing in applications and patents. —
>
> A disclosure shall not be prior art to a claimed invention under subsection (a)(2) if—
>
> (A) the subject matter disclosed was obtained directly or indirectly from the inventor or a joint inventor;
>
> (B) the subject matter disclosed had, before such subject matter was effectively filed under subsection (a)(2), been publicly disclosed by the inventor or a joint inventor or another who obtained the subject matter disclosed directly or indirectly from the inventor or a joint inventor; or
>
> (C) the subject matter disclosed and the claimed invention, not later than the effective filing date of the claimed invention, were owned by the same person or subject to an obligation of assignment to the same person.

The ’837 Patent’s Application No. 16/356,870 is a CIP of the ’177 Reference’s Application No. 15/016,178, which appears on the face of the ’837 Patent. The ’177 Reference and its Application have the same named inventor as the ’837 Patent.

(d) The expert witness incorrectly stated that the priority date of the ‘837 CIP was the filing date of March 18, 2019. The correct priority date for all the subject matter contained in the parent ’501 Patent is February 26, 2013.

The egregious errors by Joseph Paradiso, including his failure to recognize basic USPTO rules, his baseless assumptions about the patent disclosures and inventor, and his faulty analysis of the ‘837 Patent question his role as a qualified or dependable expert witness. His opening expert witness report completely disregards the Certificate of Corrections, and Joseph Paradiso is certainly not qualified to refute the decisions of the USPTO and trained Patent Examiners. In view of his errors on key matters discussed herein and in his report, Joseph Paradiso is not a reliable expert to analyze and conclude the more complex USPTO-related issues regarding novelty under U.S.C. §102 or non-obviousness under U.S.C. §103, and indefinite conclusions under 35 U.S.C. § 112.

In this rebuttal, content in the opening expert report is identified by paragraph number and discussed by the Plaintiff followed by Responses by the Plaintiff. Due to Joseph Paradiso’s inexpert, unsound reliance on the original, outdated claim language in the ‘827 Patent instead of the corresponding correct and current claim language in the Certificate of Correction, the format within this rebuttal presents:

1) ~~original claim language in strikethrough format~~
*followed by*
2) Certificate of Correction claim language

## 2. REBUTTAL TO: IV. LEGAL PRINCIPLES

Section B Priority Date, Paragraphs 22 to 23 of Opening Expert Report

Joseph Paradiso stated, "I understand that, subject to the next paragraph, the asserted "priority date" of a patent is the earlier of: (a) the date on which a patent application is filed; or (b) the date on which an earlier-filed patent application is filed if the patentee claims the benefit of priority to that earlier filed patent application."

RESPONSE – Joseph Paradiso's misunderstanding of the exception defined in 35 U.S.C. § 102(b)(2) lead him to believe that the U.S. Pat. Pub. No. 2016-0163177 Al ('177 Reference) is a valid prior art. This is incorrect, as discussed above, as the U.S. Pat. Pub. No. 2016-0163177 Al ('177 Reference) is not valid prior art but a valid CIP with common inventor. Furthermore, as shown on the face of the '837 Patent, the USPTO recognized that the '837 was a valid CIP to the '501 Patent.

Section B Priority Date, Paragraph 23 of Opening Expert Report

Joseph Paradiso stated, "I understand that it is not enough for a patent to merely claim the benefit of an earlier-filed application, but that additional criteria must be met. I understand that to obtain the benefit of the filing date of an earlier-filed application, the claims of the later-filed application must be supported by the written description in the earlier-filed application in sufficient detail that one skilled in the art can clearly conclude that the inventor invented the claimed invention as of the filing date sought. I also understand that a priority-date analysis is on a claim-by-claim basis. I further understand that the earlier-filed application's specification must contain an equivalent description of the claimed subject matter. A description which renders obvious the claimed invention for which an earlier filing date is sought is not sufficient."

RESPONSE – The specification of Patent 10,410,501 is substantially the same as that filed on the 16/356,870 but added new matter for wireless technology, for example LoRa. The Plaintiff had included the LoRa frequency range in a table in the '501 Patent.

## 3. REBUTTAL TO: V. SUMMARY OF OPINIONS

Paragraph 42 of Opening Expert Report

Joseph Paradiso stated, "As described in detail below, it is my opinion that the Asserted Claims of the '837 Patent are invalid for being anticipated or rendered obvious by U.S. Patent No. 8,843,241 to Saberi et al."

RESPONSE - '837 patentable features over Saberi are addressed in detail in Section 7b below in this rebuttal.

The Asserted Claims are Anticipated or Rendered Obvious b U.S. Patent No. 8,843,241 to Saberi et al. contains a detail of rebuttals that Saberi does not anticipate nor make obvious the 837 U.S. Patent.

In summary, Saberi does not disclose or claim any of the following limitations or elements:

d) one or more wireless communication technologies comprising at 1east one of LoRa, a Sigfox, an U1tra Narrow Band (UNB), a 6LoWPAN, a NB-IoT, or a 4G/LTE-M cellular technology, or any combination thereof;

e) wherein the one or more wireless communication technologies utilizes authentication and encryption technologies for pairing operations and to prevent unauthorized access to a water data or information (communication hub utilizes encryption to transfer the water data to a remote computers or servers or a cloud computing company).

f) wherein the one or more wireless communication technologies comprising at least one of the LoRa, the Sigfox, the Ultra Narrow Band (UNB), the 6LoWPAN, the WiMAX, the NB-loT, the 3GPP cellular, the 4G/LTE-M cellular, or the 5G cellular technology, or any combination thereof, consists of a duplex technology to transmit the water use data, the water energy use data, the water quality data, or the leak detection information, or any combination thereof, and send commands to regulate the water control valve mechanism;

water energy use as defined in the specification;

water quality data as defined in the specification;

the CPU, the microprocessor, or the microcontroller, or any combination thereof, includes at least one of a programming setting managed by a user to remotely set a mode setting or modify a default setting processed by a manufacturer to:

a) record a water flow event to an integrated memory bank or a removable memory device for analysis;

b) combine a plurality of water flow events into the integrated memory bank and subsequently schedule the transfer of the water flow events to a one or more remote computers or servers or to a cloud computing company;

c) transfer the water flow event to the one or more remote computers or servers or to the cloud computing company,

d) transfer the water data or information utilizing a blockchain technology to the one or more remote computers or servers or to the cloud computing company,

e) modify water units or timing units,

f) establish alarm set points; or any combination thereof;

Paragraph 43 of Opening Expert Report

Joseph Paradiso stated, "It is also my opinion that the Asserted Claims of the '837 Patent are invalid for being anticipated by U.S. Patent Publication No. 2016/0163177 to Klicpera."

RESPONSE – The "Klicpera" '177 Patent Publication ('501 Patent) is not a valid prior art in accordance with USPTO laws as discussed in Section 7c in this rebuttal report.

Current patent law 35 U.S.C. 102 (b)(2) provides exceptions for disclosures appearing in applications and patents which states that a disclosure shall not be prior art to a claimed invention under subsection (a)(2):

(A) the subject matter disclosed was obtained directly or indirectly from the inventor or a joint inventor;

(B) the subject matter disclosed had, before such subject matter was effectively filed under subsection (a)(2), been publicly disclosed by the inventor or a joint inventor or another who obtained the subject matter disclosed directly or indirectly from the inventor or a joint inventor; or

(C) the subject matter disclosed and the claimed invention, not later than the effective filing date of the claimed invention, were owned by the same person or subject to an obligation of assignment to the same person.

The ’837 Patent’s Application No. 16/356,870 is a CIP of the ’177 Reference’s Application No. 15/016,178, which appears on the face of the ’837 Patent. The ’177 Reference, and its application have the same named inventor as the ’837 Patent.

Paragraph 44 of Opening Expert Report

Joseph Paradiso stated, “Further, for the reasons described in detail below, it is my opinion that the Asserted Claims of the ’837 Patent are invalid for failing to satisfy the written description requirement.”

RESPONSE – The current and correct Claims presented in the Certificate of Correction satisfy the written description requirement as discussed in Section 8 of this rebuttal report.

Here and throughout the Opening Expert Report by Joseph Paradiso, the claims and specification of the Certificate of Correction were ignored; Joseph Paradiso’s analyses and conclusions were made with regard to outdated claim language.

Paragraph 45 of Opening Expert Report

Joseph Paradiso stated, “In addition, for the reasons described in detail below, it is my opinion that the Asserted Claims of the ’837 Patent are invalid for indefiniteness.”

RESPONSE – The current and correct Claims presented in the Certificate of Correction negate indefiniteness as discussed in Section 9 of this rebuttal report.

Here again and throughout the Opening Expert Report by Joseph Paradiso, the claims and specification of the Certificate of Correction were ignored; Joseph Paradiso's analyses and conclusions were made with regard to outdated claim language.

## 4. REBUTTAL TO: VI. PRIORITY DATE OF THE ASSERTED CLAIMS OF THE '837 PATENT

Paragraph 47 of Opening Expert Report

Joseph Paradiso asserted that independent claim 42 includes the following limitation: "one or more wireless communications technologies comprising at least one of a LoRa, *Sigfox*, Ultra Narrow Band 6LowPAN, *NB-IoT*, LTE-M cellular, and 5G cellular technology" (emphasis added)."

RESPONSE – Claim 42 has been amended in the Certificate of Correction and the updated Claim 42 addresses all of Joseph Paradiso priority arguments.

Paragraph 48 of Opening Expert Report

Joseph Paradiso stated, "The "Sigfox" and "NB-IoT" communications technologies were added to the '870 Application and are not supported by any of the priority applications. For example, the disclosure reproduced below regarding Sigfox was added to the '870 Application and was not included in any of the priority applications. Indeed, the term "Sigfox" does not appear in any of the priority applications."

Paragraph 49 of Opening Expert Report

Joseph Paradiso incorrectly stated, "In my opinion, the disclosures in the priority applications fail to reasonably convey to a POSA that the inventor had possession of the Sigfox communications technology later claimed in claim 42 of the '837 Patent."

RESPONSE – Through review of peer review articles and discussions with Rein Tech, Inc, electrical and software engineers, it was decided to add some frequencies to the list of wireless technology candidates. In the Certificate of Correction, Claim 42 reads:

> f) wherein the one or more wireless communication technologies comprising at least one of the LoRa, the Sigfox, the Ultra Narrow Band (UNB), the 6LoWPAN, the WiMAX, the NB-loT, the 3GPP cellular, the 4G/LTE-M cellular, or the 5G cellular technology, or any combination thereof... (*underlining added*)

The Sigfox is an alternate wireless communication technologies of Claim 42, (one or more wireless communication technologies, or, and any combination thereof). Hence, not all of Claim 42 wireless technology is constricted to the filing date of the '870 Application of March 18, 2019, only the Sigfox frequency. The other alternated technologies LoRa, the Ultra Narrow Band (UNB), the WiMAX, the 3GPP cellular, or the 5G cellular technology all have earlier priority date that is prior to the March 18, 2019 date. (underlining added)

In addition, in November of 2017, Al Somerville, Rein Tech's primary electrical engineer, and I discussed other wireless communication technologies beyond the LoRa that we were utilizing in our Rein Tech water meter residential study. During this meeting, we discussed M-Bus, NB and NB-IoT, LoRa's European competitor SigFox, 4G/LTE, and 5G, and 6LoWPAN technology. We wanted to keep track of the emerging wireless technologies to see if LoRa would still be the best candidate for long range wireless, or if other technologies would provide a better solution or candidate. Hence, the inventor was aware of SigFox, M-Bus, NB-IoT, 4G/LTE, 5G, and 6LoWPAN in November 2017.

Hence, the inventor had possession for the SigFox wireless frequency before the filing date of the '837 Patent. The earliest priority date of independent Claim 42 is not confined to the '837 Patent filing date of March 18, 2019.

Paragraph 50 of Opening Expert Report

Joseph Paradiso stated, "the disclosure reproduced below regarding NB-IoT (narrowband internet of things) was added to the '870 Application and was not included in any of the priority applications. Indeed, the term "NB-IoT" does not appear in any of the priority applications."

Paragraph 51 of Opening Expert Report

Joseph Paradiso incorrectly stated, "In my opinion, the disclosures in the priority applications fail to reasonably convey to a POSA that the inventor had possession of the NB-IoT communications technology later claimed in claim 42 of the '837 Patent."

RESPONSE – Hence, the inventor had possession for the NB-IoT wireless frequency before the filing date of the '837 Patent. The earliest priority date of independent Claim 42 is not confined to the '837 Patent filing date of March 18, 2019.

Paragraph 52 of Opening Expert Report

Joseph Paradiso incorrectly stated, "Consequently, the earliest priority date for the Asserted Claims (independent claim 42 and its asserted dependent claims 47, 48, and 49) is the filing date of the '870 Application, i.e., March 18, 2019."

RESPONSE – Through review of peer review articles and discussions with Rein Tech, Inc, electrical and software engineers, it was decided to add some frequencies to the list of wireless technology candidates. In the Certificate of Correction, Claim 42 reads:

f) wherein the one or more wireless communication technologies comprising at least one of the LoRa, the Sigfox, the Ultra Narrow Band (UNB), the 6LoWPAN, the WiMAX, the NB-loT, the 3GPP cellular, the 4G/LTE-M cellular, or the 5G cellular technology, or any combination thereof...(*underlining added*)

The NB-IoT is an alternate of the Claim 42, (one or more wireless communication technologies, or, any combination thereof). Hence, not all of claim 42 is constricted to the same filing date of the '870 Application of March 18, 2019, only the NB-IoT frequency. The alternated technologies LoRa, the Ultra Narrow Band (UNB), the WiMAX, the 3GPP

cellular, the or the 5G cellular technology all can have earlier priority dates before the March 18, 2019. (*underlining added*)

In addition, in November of 2017, Al Somerville, Rein Tech's primary electrical engineer, and I discussed other wireless communication technologies beyond the LoRa that we were utilizing in our Rein Tech water meter residential study. During this meeting, we discussed M-Bus, NB and NB-IoT, LoRa's European competitor SigFox, 4G/LTE, and 5G, and 6LoWPAN technology. We wanted to keep track of the emerging wireless technologies to see if LoRa would still be the best candidate for long range wireless, or if other technologies would provide a better solution or candidate. Hence, the inventor was aware of SigFox, M-Bus, NB-IoT, 4G/LTE, 5G, and 6LoWPAN in November 2017.

Hence, the inventor had possession of all the wireless frequencies before the filing date of the '837 Patent. The earliest priority date of Independent Claim 42 and Dependent Claims 47, 48, and 49 are not confined to the '837 Patent filing date of March 18, 2019.

Paragraph 53 of Opening Expert Report

Joseph Paradiso asserted that independent claim 42 also includes the following limitations: "transfer the water flow data utilizing a *blockchain* format to one or more remote computers or servers, or cloud service company" (emphasis added); and "one or more wireless communications technologies comprising at least one of a LoRa, Sigfox, Ultra Narrow Band *6LowPAN*, NB-IoT, *LTE-M* cellular, and 5G cellular technology" (emphasis added).

Paragraph 54 of Opening Expert Report

Joseph Paradiso stated, "The "blockchain" format and "6LowPAN" and "LTE-M" communication technologies were added to the '529 Provisional, but are not supported by any of the other priority applications (i.e., the '178 Application1 or the '339 Provisional). See, e.g., '529 Provisional ¶108 (discussing "Block-Chain" technology), ¶46 (discussing "6LoWPAN" technology), ¶49 (discussing "LTE-M" technology)."

Paragraph 55 of Opening Expert Report

Joseph Paradiso stated, “In my opinion, the disclosures in the ’178 Application and the ’339 Provisional fail to reasonably convey to a POSA that the inventor had possession of the “blockchain” format or the “6LowPAN” and “LTE-M” communication technologies later claimed in claim 42 of the ’837.”

Paragraph 56 of Opening Expert Report

Joseph Paradiso stated, “Consequently, the Asserted Claims (independent claim 42 and its asserted dependent claims 47, 48, and 49) are not entitled to an effective filing date earlier than the January 22, 2019, filing date of the ’529 Application Patent.”

RESPONSE - In Independent Claim 42, the alternative technologies LoRa, the Ultra Narrow Band (UNB), the WiMAX, the 3GPP cellular, or the 5G cellular technology can each have earlier priority dates than the March 18, 2019 date. Claims 47, 48, and 49, being dependent on Claim 42, have earlier priority dates than the March 18, 2019 date.

In addition, in November of 2017, Al Somerville, Rein Tech’s primary electrical engineer, and the inventor discussed other wireless communication technologies beyond the LoRa that we were utilizing in Rein Tech water meter field study. During this meeting, we discussed M-Bus, NB, and NB-IoT, LoRa’s European competitor SigFox, 4G/LTE, 5G, and 6LoWPAN technology. We tracked emerging wireless technologies and observed if LoRa would be the best candidate for long range wireless, or if other technologies would provide a better solution or candidate. Hence, the inventor was aware of SigFox, M-Bus, NB-IoT, 4G/LTE, 5G, and 6LoWPAN in November 2017.

And in Claim 42:

> the CPU, the microprocessor, or the microcontroller, or any combination thereof, includes at least one of a programming setting managed by a user to remotely set a mode setting or modify a default setting processed by a manufacturer to:
> a) record a water flow event to an integrated memory bank or a removable memory device for analysis;

b) combine a plurality of water flow events into the integrated memory bank and subsequently schedule the transfer of the water flow events to a one or more remote computers or servers or to a cloud computing company;
c) transfer the water flow event to the one or more remote computers or servers or to the cloud computing company,
d) transfer the water data or information utilizing a blockchain technology to the one or more remote computers or servers or to the cloud computing company,
e) modify water units or timing units,
f) establish alarm set points; or any combination thereof;

The block chain technology in Independent Claim 42 (d) is also an alternative to a, b, c, e, and f (or any combination thereof), so a, b, c, e, and f can have a priority date before March 18, 2019. Hence, Claim 42 and asserted dependent claims 47, 48, and 49 have a priority date prior to the March 18, 2019 date.

The inventor was aware of bitcoin transactions in 2017 with the growth of Coinbase and other bitcoin distributors and their hacking problems. The inventor researched how hacking could be accomplished with blockchain technology.

**5. REBUTTAL TO: VII. LEVEL OF ORDINARY SKILL IN THE ART**

Paragraphs 57 to 58 of Opening Expert Report

Joseph Paradiso, stated, "For purposes of my assessment of the validity issues in this report, I was asked to consider the patent claims and the prior art through the eyes of a POSA at the time of the alleged invention, which I understand based on the discussion above to be no earlier than March 18, 2019."

RESPONSE - Joseph Paradiso incorrectly implies a priority date of March 18, 2019. The 11,549,837 Patent (Application No. 16/356,870) is a CIP of the Parent Application No. 15/016,178, (now issued patent 10,410,501), which appears on the face of the '837 Patent. All patent language disclosed and claimed in the '178 Application are incorporated by

reference into the '837 CIP which receives the priority date of '178 Application (filing date of February 4, 2016). Furthermore, the '501 Patent ('178 Application) is a CIP of the Parent Application 13/776,963, filed on Feb 26, 2013, now Patent No. 9,297,150.

Joseph Paradiso did not comprehend the determination of the CIP priority dates or possibly intentionally introduced bias by restricting the priority date to the '837 filing date.

Under the current first-to-file patent policy, the Plaintiff filed for LoRa and other wireless frequencies in advance of any prior art. Additionally, the Plaintiff researched LoRa in early 2015 and began ordering custom PCBs and radios using LoRA wireless technology in 2016. If the expert witness carefully reviewed the Application No. 15/016,178, (now issued patent 10,410,501), the expert witness would have observed that the Plaintiff included the LoRa frequency in a table on 12:53-67, which includes the U.S. LoRa frequency range of 902-928 MHz. This same table is present on 6:36-50 in Patent Application 13/776,963, filed on Feb 26, 2013, now Patent No. 9,297,150 ('150 Patent).

Here again and throughout the Opening Expert Report by Joseph Paradiso, the claims and specification of the Certificate of Correction were ignored; Joseph Paradiso's analyses and conclusions were made with regard to outdated claim language.

## 6. REBUTTAL TO: VIII. CLAIM CONSTRUCTION

Paragraph 62 of Opening Expert Report

Joseph Paradiso report includes, "In the Court's November 26, 2024, Claim Construction Order (D.I. 151), the Court construed the following terms from the '837 Patent." His report shows the original '837 Patent claim language as:

| Claim(s) | Term/Phrase | Construction |
|---|---|---|
| 42 | "water control mechanism" | "A device that controllably modifies a flow of water." |
| 47 | "water control valve mechanism" | "A device that controllably modifies a flow of water." |

RESPONSE - Initially, the Plaintiff updated the Defendant's original Term/Phrase Construction Chart to align with the Certificate of Correction (dated October 15, 2024) for the '837 Patent. The term "water control mechanism" in Independent Claim 42 was corrected to "water control valve mechanism," which was consistent with Dependent Claim 47. The Plaintiff's Delaware Attorney then provided the updated Term/Phrase Construction chart to the Defendant. However, it appears that the Defendant subsequently submitted their original Term/Phase Construction chart to the Court and not the correct, updated chart. Apparently, Joseph Paradiso also improperly chose to use or was instructed to use Defendant's original chart and ignored the approved '837 Patent Certificate of Correction. Regardless of the Term/Phase Construction Chart version, the approved Certificate of Correction consistently uses the term "water control valve mechanism" in Independent Claim 42 and Dependent Claim 47.

**7. REBUTTAL TO: IX. THE ASSERTED CLAIMS ARE RENDERED INVALID BY THE PRIOR ART**

**a. SABERI PATENT NO. 8,843,241**

Paragraphs 64 to 66 of Opening Expert Report

RESPONSE - The Saberi '241 Patent is a typical omnibus patent that discloses monitoring electrical meters, gas meters, and water meters. The Saberi '241 Patent uses the nebulous term "commodity usage" to attempt to cover all these different types of meters as well as electrical energy use, gas use, and water use. The Saberi '241 Patent also discloses that "messages" can be encrypted, but there is no disclosure that commodity usage is sent using confidential or encrypted technology. Furthermore, the Saberi '241 Patent fails to disclose or claim limitations and elements in the '837 Patent, including one or more wireless communication technologies having the capability to transfer water parameter data utilizing confidential technology from the base station to at least one of a private, commercial, and third-party network to a remote offsite central monitoring computer. In addition, the '241 Patent Node 101 is shown in Fig. 3, and Figs. 9, 10, 11, 12, 13a, 13b, 13c, 14a, and 14b show

that the nodes communicate with each other. However, the ‘837 base stations are designed and configured to communicate with one or more communication hubs.

The expert witness is not a POSITA like the named inventor and the patent examiner who reviewed and approved patent application. Moreover, the burden of invalidity is on the expert witness to prove with clear and convincing evidence to overcome the presumption of validity under 35 U.S.C. 282(a). *Microsoft Corp. v. i4i Ltd. P'ship*, 564 U.S. 91, 95 (2010), hereinafter referred to as (“*i4i*”). Furthermore, the expert witness should be cautious not to introduce bias or improper hindsight. For example, the expert witness stated in Paragraph 100 of his Opening Expert Report that “it would have been obvious also to utilize LoRaWAN technology (with encryption and authentication) with the embodiments of Saberi.” But the Saberi ‘241 Patent claims a priority date of May 2009 and LoRa (short for "Low Power and Long Range") was developed in the 2014-2015 period by Semtech Corporation. LoRa functions to send and receive radio signals that can handle a lot of noise while using very little power. It works by turning data into special sounds called chirps. Semtech Corporation, the leader in fabricating microchips and radios for LoRa technology, filed its first LoRa patent on September 6, 2015, as Patent Application 14/849,209 which issued as the 9,525,454 Patent, on December 20, 2016. Rein Tech began investigating LoRa in January 2015 after engineering concerns with Wi-Fi range limitations and cellular costs observed during manufacturing of early PCB prototypes and operating water meter tests (Exhibit B - KISS LoRa Report dated January 2015 and Exhibit C - email From Al Somerville dated December 14, 2015).

Paragraphs 70 to 74 of Opening Expert Report

Original claim: ~~a base station having a water control mechanism interposed between a main water supply line and a water supply for a building or structure~~;

Certificate of Correction: a base station having a water control valve mechanism interposed between a main water source and a water supply line for a building or a structure;

RESPONSE - Here again and throughout the Opening Expert Report by Joseph Paradiso, the claims and specification of the Certificate of Correction were ignored; Joseph Paradiso's analyses and conclusions were made with regard to outdated claim language.

At 18:18-21, the Saberi '241 Patent states that "The valve 302 may be configured to open or close a commodity supply line 316 in response to a message from a processing module 202. The valve 302 may be powered by rechargeable batteries" (*emphasis added*). A POSITA would interpret that using rechargeable batteries separate than the power supply 206 and power supply interface 314 (or power interface 314 as shown in Figure 3), to provide power indicates that valve 302 is remote to the node 101 or control unit 1102. This remote valve is supported by 18:27-29 embodiments, "...the valve may be installed in a supply line, near the installation of the meter." In the '837 Patent present invention, the water valve control mechanism is contained within the base station. POSITAs would view the arguments by Joseph Paradiso as not meeting the clear and convincing standard for anticipation.

Number 3, Paragraphs 75 to 76 of Opening Expert Report

Original claim: ~~said base station further comprising; a) electrical circuitry including at least one of a CPU, microprocessor and microcontroller with a power source;~~

Certificate of Correction: a) an electrical circuitry including at least one of a CPU, a microprocessor, or a microcontroller, or any combination thereof;

RESPONSE - Here again and throughout the Opening Expert Report by Joseph Paradiso, the claims and specification of the Certificate of Correction were ignored; Joseph Paradiso's analyses and conclusions were made with regard to outdated claim language.

Number 4, Paragraphs 77 to 88 of Opening Expert Report

Original claim: ~~b) one or more flow rate sensor connected to the main water supply and connected to said electrical circuitry and designed to monitor at least one of a water use data, water energy use data, water quality data and leak detection information from said building or structure, said one or more flow rate sensors connected to the main water supply and connected with said electrical circuitry~~;

Certificate of Correction: b) one or more flow rate sensors connected to the water supply line and designed to monitor at least one or water use data, a water energy use data, a water quality data, or a leak detection information, or any combination thereof, from the building or the structure, the one or more flow rate sensors connected with the electrical circuitry;

RESPONSE - Here again and throughout the Opening Expert Report by Joseph Paradiso, the claims and specification of the Certificate of Correction were ignored; Joseph Paradiso's analyses and conclusions were made with regard to outdated claim language.

The Saberi '241 Patent does not disclose or claims water energy use data.

It is USPTO policy that the Inventor can be a lexicographer for terms used in the specification. If the expert witness, Joseph Paradiso had read the specification as closely as has for challenging the validity of the '837 patent, he should not have missed paragraph [0045] of the Klicpera U.S. Patent Publication No.2016/0163177, the Parent of the '837 Patent, which defined the water energy use term, "Water energy use refers to the ratio of cold or ambient water to heated water use or the ratio of hot water to the total water use . . ." And the expert witness is not a POSITAs like the named inventor and the patent examiner who reviewed and approved patent application. Furthermore, the expert witness has not met the clear and convincing standard for invalidity that *i4i* requires. For these reasons, Claim 42 in not indefinite under 35 U.S.C §112.

Saberi also does not disclose or include a claim that describes what the water quality sensors is designed to monitor. Saberi specification is silent on the water quality sensors and is vague at best. The '837 water quality sensors disclose monitoring for halogen elements, total dissolved solids (TDS), metallic or iron compounds, water hardness, biological or coliform contaminates, or pH levels. Joseph Paradiso stated that it would be obvious for turbidity could be observed with an optical sensor, but turbidity is not a feature disclosed, nor an optical water quality sensor, in the '837 Patent specification. The closest is total dissolved solid (TDA) and there are sensors other than optical sensors for measuring the TDA. Saberi is vague and does not disclose or support any type(s) of water quality sensor.

POSITAs would view the arguments by Joseph Paradiso as not meeting the clear and convincing standard for anticipation.

Paragraph 77 of Opening Expert Report

Joseph Paradiso states "For example, as shown in Figure 3 below, Saberi discloses that the base station comprises one or more flow rate sensors that are connected to the electrical circuitry by teaching that "[i]n one embodiment of the invention, the system further comprises a sensor coupled to the processing module,"

RESPONSE – Saberi does not disclose an electrical circuitry having a CPU, a microprocessor or a microcontroller, or any combination thereof. Saberi only discloses a processor that can be a microprocessor but there is no disclosure of electrical circuitry.

Saberi shows in Fig. 3 drawing that a sensor 214 but this is sensor 214 also used for Fig. 4 for the gas sensor and Fig. 5 electrical meter. This creates confusion for a POSITA as sensor for water (fluid sensor), gas (gas sensor) and electric meter (electricity sensor) are different types of sensors. In 21:13-15 sensor 214 is defined as a pressure sensor, temperature sensor, water quality sensor ... Joseph Paradiso states "comprising at least one sensor 214" (id. at 18:13-16) and that "[i]n one embodiment of the invention, the sensor 214 may detect disturbances in the flow of water [and] the sensor 214 may be programmable and may alert the processing module 202 [of] leaks" (id. at 16:35-46). A pressure sensor as, disclosed in Saberi can accomplish detecting disturbances in the water flow. A general pressure sensor is not a flow rate sensor unless it is a differential pressure flow sensor the calculates fluid pressure by measuring the pressure at two different velocities. And this is not disclosed by the '241 Patent. Furthermore, since sensor 214 is defined for the water meter, the gas meter, and the electric meter, that same sensor would need to have the unique capability to measure all three, water flow, gas flow, and electricity flow.

Joesph Paradiso states, "Saberi further discloses that "[i]n another embodiment, the sensor comprises a plurality of Hall effect switches for detecting a water flow through the meter and

a counter device for quantifying the water flow into a flow rate." (Id. at 4:48-51.) But Hall effect switches are plagued with Magnetic Field Pollution: The magnetic field can be disturbed by external when the output limit is 20mA or even less and extreme temperatures where locations with large temperature variations can cause loss of accuracy.

There is no disclosure in Saberi that sensor 214 is a flow rate sensor as defined in the specification of the '837 Patent such as invasive sensors vane, wheel or turbine flow rate sensors or non-invasive sensors such a ultrasonic and magnetic flow sensors.

Saberi also does not disclose or include a claim that defines concerning the water quality sensors monitoring capabilities. The '837 water quality sensors disclose monitoring for halogen elements, total dissolved solids (TDS), metallic or iron compounds, water hardness, biological or coliform contaminates, or pH levels.

Paragraph 78 of Opening Expert Report

Saberi specifically discloses that "sensor 214 [is] electrically coupled to the power supply 206 and power supply interface 314 and the processing module 202 for recording sensor data and comprising at least one sensor 214" (id. at 18:13-16) and that "[i]n one embodiment of the invention, the sensor 214 may detect disturbances in the flow of water [and] the sensor 214 may be programmable and may alert the processing module 202 [of] leaks" (id. at 16:35-46).

RESPONSE - Joseph Paradiso uses Fig 3 with flow rate sensor pointing to a water meter and another pointing to sensor 214. But a water meter is more than one or more flow rate sensor, because most water meters have a display, input and output couplings, and a waterproof housing. And sensor 214 shown is also used for Fig. 4 for the gas sensor and Fig. 5 electrical meter. This creates confusion for a POSITA as sensor for water (fluid sensor), gas (gas sensor) and electric meter (electricity sensor) are different types of sensors. In 21:13-15 sensor 214 is defined as a pressure sensor, temperature sensor, water quality sensor ... Joseph Paradiso states "comprising at least one sensor 214" (id. at 18:13-16) and that "[i]n one embodiment of the invention, the sensor 214 may detect disturbances in the flow of water [and] the sensor 214 may be programmable and may alert the processing module 202 [of]

leaks" (id. at 16:35-46). A pressure sensor as, disclose in Saberi can accomplish detecting disturbances in the water flow (but not perform as a flow rate sensor).

Paragraph 79 of Opening Expert Report

Joseph Paradiso states, "Saberi also teaches that "[t]he water meter 304 may be able to measure the water
flowing into a customer's premise and be able to shut off the water supply through the commodity supply line 316 or turn on the water supply through the commodity supply line 316." Id. at 18:30-33. "According to exemplary embodiments, the water meter 304 may be any of various types of meters used on water lines for measuring and control of water flow." Id. at 19:14-16. "It should be appreciated that water meters, such as water meter 304, may use other flow measuring means, such as turbines." Id. at 19:52-56."

RESPONSE – But a water meter is more than one or more flow rate sensor, most water meters have a display, input and output couplings, and a water-proof housing. The flow rate sensor of the '837 Patent does not have a display, any input and output couplings, or any water-proof housing.

Paragraph 82 of Opening Expert Report

Joseph Paradiso stated that "Saberi also discloses that "[a]s depicted in FIG. 17, the meter system 1700 may be a compound meter, having two flow meters sections with the flow between the two sections controlled by an automatic valve assembly."

RESPONSE - Saberi does not disclose that one or more flow rate sensors would be used for monitoring water energy (one flow rate sensor on the hot water line and another flow rate sensor on the cold-water line), as is disclosed in the '837 specification.

Also, one or more flow rate sensors would be used for monitoring the water line to residence or corporation and another water flow sensor to the irrigation lines, as disclosed in the '837 specification.

Paragraph 83 of Opening Expert Report

Joseph Paradiso stated, "I understand that in its infringement contentions, Rein Tech argues that Mueller's accused products meet the limitation "one or more flow rate sensors connected to the main water supply" where such sensors may be coupled indirectly to the main water supply. That is, in the accused products, any sensors are internal to the products and separated from the main water supply by other components. It is my understanding that the Court construed the limitation of "one or more flow rate sensor[s] connected to the main water supply" as meaning "one or more devices *coupled directly to the main water supply* to measure the rate of a flow of water through said water supply" (Claim Construction Order (D.I. 151) (emphasis added)), which I understand to preclude Rein Tech's characterization of the accused products. Accordingly, I disagree that any such sensors in the accused products are "connected to" the main water supply as required by this claim
limitation."

RESPONSE – The court claim construction order stands over Joseph Paradiso disagree with allowed construction. The one or more devices coupled directly to the main water supply to measure the rate of a flow of water through said water supply will account for invasive water flow rate sensor (nutating disc) and non-invasive water flow rate sensor (ultrasonic sensor).

Paragraph 84 of Opening Expert Report

Joseph Paradiso stated, "However, even if "connected to the main water supply" encompassed indirect coupling (which it does not), Saberi meets this limitation. More specifically, the Saberi sensor 214 may be a flow rate sensor, and the displacement meter and turbine meters of the meter systems incorporated into the base station of FIG. 3 (see FIGS. 17, 20A-21B) necessarily include flow rate sensors as well."

RESPONSE – The discussion in paragraphs 78 and 80 above contradict Joseph Paradiso's arguments. Saberi's sensor 214 and water meter is not a flow rate sensor. The '837 Patent clearly discloses a flow rate sensor.

Paragraph 85 of Opening Expert Report

Joseph Paradiso stated that "Saberi discloses that the flow rate sensor is designed to monitor water use data by teaching that "[t]he water meter 304 may be able to measure the water flowing into a customer's premise and be able to shut off the water supply through the commodity supply line 316 or turn on the water supply through the commodity supply line 316." (Id. at 18:30-33.) Saberi further discloses that "[a]ccording to exemplary embodiments, the water meter 304 may be any of various
types of meters used on water lines for measuring and control of water flow." (Id. at 19:14-16.) See also id. at 19:52- 56

RESPONSE – The discussions in paragraphs 78 and 80 above demonstrate that Joseph Paradiso's arguments are incorrect. The Saberi sensor 214 and water meter are not a flow rate sensor. A water meter is more than one or more flow rate sensor, most water meters have a display, input and output couplings, and a waterproof housing. The flow rate sensor of the '837 Patent does not have a display, any input and output couplings, or any water-proof housing.

Paragraph 86 of Opening Expert Report

Joseph Paradiso stated that "Similarly, Saberi discloses that "[m]eter system 1700 may be used in the system 300 as depicted in FIG. 3. As may be appreciated from the disclosures herein, the meter system 1700 may be configured to provide control of fluid flow, measurement of flow fluid, and energy harvesting from the fluid flow." (Id. at 50:62-66.) Further, "[a]s depicted in FIG. 17, the meter system 1700 may be a compound meter, having two flow meters sections with the flow between the two sections controlled by an automatic valve assembly." (Id. at 51:57-60.) See also id. at 54:61-66 ("Meter system 2000 may be used in the system 300 as depicted in FIG. 3. As will be appreciated from the disclosures herein, the meter system 2000 may be configured to provide . . . measurement of flow fluid, and energy harvesting from said fluid flow"); id. at 53:45-49 ("According to exemplary embodiments, the control PCB 1752 may perform . . . calculation of the amount of fluid flow through the meter section 1702"); id. at 54:6-7 ("As described above, the control PCB 1752 also performs calculation of fluid flow through the meter section").

RESPONSE – The discussions in paragraphs 78 and 80 above demonstrate that Joseph Paradiso's arguments are incorrect. The Saberi sensor 214 and water meter are not a flow rate sensor. The Certificate of Correction states that "c) a power source that is at least one or an AC powered, a DC powered, or a one or more standard or rechargeable batteries, or any combination thereof, the rechargeable batteries capable of being supplemented with a turbine or other rotational mechanism that generates electrical energy, the power source is electrically connected to the electrical circuitry,"

First, the rotational mechanism that generates electrical energy is an optional for rechargeable batteries.

Second, one or more flow rate sensors would be used for monitoring water energy use (one flow rate sensor on the hot water line and another flow rate sensor on the cold water line) and the Saberi '241 Patent does not disclose water energy monitoring. Also, one or more flow rate sensor would be used for monitoring the water line to residence or corporation, and another water flow sensor to the irrigation distribution lines. Monitoring for irrigation distribution lines is also not disclosed by the '241 Patent.

Third, "The control section 1706 may have a control printed circuit board ("PCB") 1752. The control PCB may perform the functions of the water meter node 102 as described herein." Later is says that … "the control PCB 1752 also performs calculation of fluid flow though meter section." As already demonstrated, a water meter is more than one or more flow rate sensor, most water meters have a display, input and output couplings, and a waterproof housing. The flow rate sensor of the '837 Patent does not have a display, nor any input, output couplings or a waterproof housing.

Paragraph 87 of Opening Expert Report

Joseph Paradiso states, "Saberi also discloses that the flow rate sensor is designed to monitor water quality

by teaching that "[i]n another embodiment, the sensor is selected from the group consisting an optical sensor, . . . water quality sensor, . . . [and] a water composition sensor." (Id. at 4:39-44).

See also id. at 21:13-15 ("The sensor 214 may comprise . . . water quality sensors"). In addition to
the expressly named "water quality sensors," a POSA would understand that optical sensors are commonly used to measured turbidity, which is one water quality metric that measures the cloudiness of water due to suspended particles

RESPONSE - Saberi also does not disclose or include a claim that explains what the '241 Patent water quality sensors are designed to monitor. Joseph Paradiso states that it would be obvious to monitor for turbidity with an optical sensor. However, the '837 Patent does not disclose or claim turbidity in its water quality listing and does not employ an optical sensor to measure turbidity. The '837 water quality sensors disclose monitoring for halogen elements, total dissolved solids (TDS), metallic or iron compounds, water hardness, biological or coliform contaminates, or pH levels. There are several type of total dissolve sensors (the closest to turbidity) that are not optical in operation.

Paragraph 88 of Opening Expert Report

Joseph Paradiso stated that "A POSA would further understand that Saberi teaches that the flow rate sensor is
designed to monitor leak detection information per this claim limitation by disclosing that "[i]n another embodiment, the sensor is selected from the group consisting of an optical sensor, imaging sensor, acoustic sensor, motion detector, water quality sensor, leak detector, temperature sensor,
water pressure sensor, a water composition sensor, gas flow sensor, Smoke detector, and carbon monoxide detector." (Id. at 4:39-44.) See also id. at 21:13-15 ("The sensor 214 may comprise water pressure sensors, temperature sensors, water quality sensors, or other sensors"); id. at 17:1-3 ("Nodes 101 as described herein may be adapted to monitor or control any given piece of equipment, meter, or infrastructure component");

RESPONSE - Saberi does not disclose or include a claim that identifies or explains a flow rate sensor. This is discussed in paragraphs 78 and 80 above.

Number 5, Paragraphs 89 to 93 of Opening Expert Report

Original claim: ~~"c) said power source that is at least one of an AC powered, DC powered, and one or more standard or rechargeable batteries, said rechargeable batteries capable of being supplemented with a turbine or other rotational mechanism that generates electrical energy said power source is electrically connected to said electrical circuitry;~~"

Certificate of Correction: c) a power source that is at least one or an AC powered, a DC powered, or a one or more standard or rechargeable batteries, or any combination thereof, the rechargeable batteries capable of being supplemented with a turbine or other rotational mechanism that generates electrical energy, the power source is electrically connected to the electrical circuitry;

RESPONSE - Here again and throughout the Opening Expert Report by Joseph Paradiso, the claims and specification of the Certificate of Correction were ignored; Joseph Paradiso's analyses and conclusions were made with regard to outdated claim language.

Number 6, Paragraphs 94 to 96 of Opening Expert Report

Original claim: ~~d) one or more wireless communication technologies comprising at least one of a LoRa, Sigfox, Ultra Narrow Band. 6LowPAN, NB-IoT, LTE-M cellular, and 5G cellular technology~~;

Certificate of Correction: d) one or more wireless communication technologies comprising at 1east one of LoRa, a Sigfox, an U1tra Narrow Band (UNB), a 6LoWPAN, a WiMAX, a NB-IoT, a 3GPP cellular, a 4G/LTE-M cellular, or a 5G cellular technology, or any combination thereof;

RESPONSE - Here again and throughout the Opening Expert Report by Joseph Paradiso, the claims and specification of the Certificate of Correction were ignored; Joseph Paradiso's analyses and conclusions were made with regard to outdated claim language.

The Saberi '241 Patent fails to disclose or claim limitations and elements in the '837 Patent, including wireless communication technologies for long-range capabilities Lora, Sigfox, UNB, 6LowWPAN, NB-IoT, 4G/LTE. There is also no disclosure or claim of one or more wireless communication technologies. Further, cellular 4G and 5G technologies were not

disclosed or claimed in Saberi's original provisional applications 61/108,312 filed on October 24, 2008 and 61/054,779 filed on May 20, 2008 relied upon but added as new matter during the PCT prosecution. POSITAs would view the arguments by Joseph Paradiso as not meeting the clear and convincing standard for anticipation.

Number 7, Paragraphs 97 to 101 of Opening Expert Report

Original claim: ~~e) wherein said one or more wireless communication technologies utilizes authentication and encryption technologies for pairing operations and to prevent unauthorized access to the water data or information; and~~

Certificate of Correction: e) wherein the one or more wireless communication technologies utilizes authentication and encryption technologies for pairing operations and to prevent unauthorized access to a water data or information;

RESPONSE - Here again and throughout the Opening Expert Report by Joseph Paradiso, the claims and specification of the Certificate of Correction were ignored; Joseph Paradiso's analyses and conclusions were made with regard to outdated claim language.

The Saberi '241 Patent discloses only "end-to-end encryption" for messages but not for commodity water consumption. The '241 Patent discloses "It should be appreciated that end-to-end communication may be encrypted, allowing for secure transactions. In another embodiment, the encryption may be symmetric (algorithm), Secret-key encryption, asymmetric (algorithm), public-key encryption, or Data Encryption Standard (DES)."

But the Saberi '241 Patent is also silent as to where the end-to-end (E2EE) is used. The '837 Patent discloses one or more wireless communication technologies having the capability to transfer water parameter data utilizing confidential technology from the base station to at least one of a private, commercial, and third-party network to a remote offsite central monitoring computer. From a POSITO perspective and in regards of the Saberi specification and drawings, it appears that the encryption is used to communicate messages with one or more nodes 101. As described *supra in claim 48*, the nodes 101 of the Saberi '241 Patent do not disclose the function disclosed in the '837 Patent to extend the range of the base station

wireless communication technology and do not have a second wireless transceiver to transfer water data beyond the node. So, the encryption disclosed in the '241 Patent does not extend beyond the nodes 101 wherein the '837 communication hub utilizes encryption to transfer the water data to a remote computers or servers or a cloud computing company. POSITAs would view the arguments by Joseph Paradiso as not meeting the clear and convincing standard for anticipation.

Number 8, Paragraph 102 of Opening Expert Report

Original claim: ~~f) wherein the long-range LoRa, Sigfox, UNB, NB-IoT, 6LoWPAN, WiMAX, cellular technology 3GPP and LTE-M and 5G consist of a duplex technology to both receive at least one of a water use data, water energy use data, water quality data and leak detection information and send commands to regulate the control valve mechanism~~

Certificate of Correction:

d) one or more wireless communication technologies comprising at 1east one of a LoRa, a Sigfox, an U1tra Narrow Band (UNB), a 6LoWPAN, a WiMAX, a NB-loT, a 3GPP cellular, a 4G/LTE-M cellular, or a 5G cellular technology, or any combination thereof; in the singular form "a" which corresponds with the antecedent form "the" f) wherein the one or more wireless communication technologies comprising at least one of the LoRa, the Sigfox, the Ultra Narrow Band (UNB), the 6LoWPAN, the WiMAX, the NB-IoT, the 3GPP cellular, the 4G/LTE-M cellular, or the 5G cellular technology, or any combination thereof, consists of a duplex technology to transmit the water use data, the water energy use data, the water quality data, or the leak detection information, or any combination thereof, and send commands to regulate the water control valve mechanism

RESPONSE - Here again and throughout the Opening Expert Report by Joseph Paradiso, the claims and specification of the Certificate of Correction were ignored; Joseph Paradiso's analyses and conclusions were made with regard to outdated claim language.

Unlike the '837 Patent, the Saberi '241 Patent fails to disclose or claim f) wherein the one or more wireless communication technologies comprising at least one of the LoRa, the Sigfox, the Ultra Narrow Band (UNB), the 6LoWPAN, the WiMAX, the NB-IoT, the 3GPP cellular,

the 4G/LTE-M cellular, or the 5G cellular technology, or any combination thereof, consists of a duplex technology to transmit the water use data, the water energy use data, the water quality data, or the leak detection information, or any combination thereof, and send commands to regulate the water control valve mechanism. POSITAs would view the arguments by Joseph Paradiso as not meeting the clear and convincing standard for anticipation.

Number 8, Paragraph 104 of Opening Expert Report

Joseph Paradiso stated, "[i]t should be appreciated that information collected by a water meter node may include current water meter reading information as well as other information associated with the node including but not limited to current state, power information, temperature information, water pressure information, backflow indication, and any other sensor-based information from one or more electronic sensors in communication with a node 101."

RESPONSE – The Saberi '241 Patent does not discuss or define "water meter reading information" and there is no disclosure of water flow use, water use duration and total volume, water energy use data, water quality or leak detection information as disclosed and defined in Claim 42 of the '837 Patent. POSITAs would view the arguments by Joseph Paradiso as not meeting the clear and convincing standard for anticipation.

Number 8, Paragraphs 105 to 106 of Opening Expert Report

The expert witness stated that "Meter status COMMAND messages include but are not limited to messages to request meter reading ...." (Id. at 43:8-10.) In still another embodiment, the remote coordinator 104 may be mobile including but not limited to truck, van, automobile, low flying aircraft, helicopter, laptop, PDA, or hand-held electronic device computer. (Id. at 25:56-60.)"

RESPONSE – A POSITA would not agree that the expert witness listing above is equivalent to a smart phone, a remote computer or a server supporting a web portal. A smart phone is not a hand-held electronic device computer as defined in Exhibit D. POSITAs would view the arguments by Joseph Paradiso as not meeting the clear and convincing standard for anticipation.

Number 9, Paragraphs 110 to 122 of Opening Expert Report

Original claim: ~~the CPU, microprocessor or microcontroller can at least include one of a programming setting managed by the user, remotely a mode setting, and a default or restricted setting processed by the manufacturing factory to: a) record the water flow event to a local memory bank or removable memory device for regional or controlled analysis, b) combine a plurality of water low events into a local memory bank and subsequently schedule the transfer of the water flow event dataset to a remote computer or server, or to a cloud service company, c) directly transfer the water .flow event to a remote computer or server, or to a cloud service company, or d) transfer the water flow data utilizing a blockchain format to one or more remote computers or servers, or cloud service company; and~~

Certificate of Correction: the CPU, the microprocessor, or the microcontroller, or any combination thereof, includes at least one of a programming setting managed by a user to remotely set a mode setting or modify a default setting processed by a manufacturer to:

a) record a water flow event to an integrated memory bank or a removable memory device for analysis;

b) combine a plurality of water flow events into the integrated memory bank and subsequently schedule the transfer of the water flow events to a one or more remote computers or servers or to a cloud computing company;

c) transfer the water flow event to the one or more remote computers or servers or to the cloud computing company,

d) transfer the water data or information utilizing a blockchain technology to the one or more remote computers or servers or to the cloud computing company,

e) modify water units or timing units,

f) establish alarm set points; or any combination thereof;

RESPONSE - Here again and throughout the Opening Expert Report by Joseph Paradiso, the claims and specification of the Certificate of Correction were ignored; Joseph Paradiso's analyses and conclusions were made with regard to outdated claim language.

The Saberi '241 Patent fails to disclose or claim - the CPU, the microprocessor, or the microcontroller, or any combination thereof, includes at least one of a programming setting managed by a user to remotely set a mode setting or modify a default setting processed by a manufacturer to:

a) record a water flow event to an integrated memory bank or a removable memory device for analysis;

b) combine a plurality of water flow events into the integrated memory bank and subsequently schedule the transfer of the water flow events to a one or more remote computers or servers or to a cloud computing company;

c) transfer the water flow event to the one or more remote computers or servers or to the cloud computing company,

d) transfer the water data or information utilizing a blockchain technology to the one or more remote computers or servers or to the cloud computing company,

e) modify water units or timing units,

f) establish alarm set points; or any combination thereof; (emphasis added)

The expert witness Joseph Paradiso, intentionally or negligently, overlooked the fact that the Saberi '241 Patent does not disclose or claim a water flow event as defined in the '837 specification which is defined in 6:16-26 of the '837 specification: "Water flow event or water flow event basis is defined as monitoring and sensing the initiation of water flow until the water flow is stopped, whereby the water flow rate, the duration of water flow, and the total water volume can be calculated and recorded. The water flow event will inherently save CPU and wireless transmission energy by not recording or transmitting no water use data and allowing the CPU or microprocessor to go into a sleep mode between each water event use thereby providing a superior method for analyzing water signatures and patterns for reliable discernment of leak and leak locations."

In U.S. Patent 10,410,501, which is a parent to the '837 CIP, and which is U.S. Pat. Pub. No. 2016/0163177 and Patent Application Ser. No. 15/016,178 filed on February 4, 2016, explicitly defines a water flow event at 5:65-67 to 6:14 as "Water Flow Event or Water Flow Event Basis refers to the period the water begins flowing and remains until the continuous flow of water terminates or ends, allowing observation and/or recording and/or transmission of data regarding the duration of the water use, the beginning, intermediate and ending flow rates, and the total volume of water used during the water flow event or water flow event basis."

POSITAs would view the arguments by Joseph Paradiso as not meeting the clear and convincing standard for anticipation.

Number 10, Paragraphs 123 to 129 of Opening Expert Report

Original claim: ~~the one or more wireless communication technologies capable of transmitting at least one of a 1) water use data, water energy use data, water quality data and leak detection information and, 2) obtains an instruction or signal to command the management of the water control valve or perform a command operation, using at least one of an Internet connection, a private network system, and a corporate owned network system, and a smart phone, computer, server, tablet, web portal, and other electronic communication device, that communicates with at least one of a remote computer or server, a commercial cloud company, and a web-based company.~~

Certificate of Correction: the one or more wireless communication technologies configured to:

(i) transmit at least one of the water use data, the water energy use data, the water quality data, or the leak detection information, or any combination thereof, to the one or more remote computers or servers or to the cloud computing company; and

(ii) receive an instruction or signal to command the management of the water control valve mechanism or perform another command operation;

using at least one of an Internet connection, a private network system, or a corporate owned network system that communicates with a smart phone, a computer, a server, a tablet, a web portal, or another electronic communication device.

RESPONSE - Here again and throughout the Opening Expert Report by Joseph Paradiso, the claims and specification of the Certificate of Correction were ignored; Joseph Paradiso's analyses and conclusions were made with regard to outdated claim language.

The Saberi '241 Patent does not disclose or claim water energy use data nor does it disclose or claim remote servers, cloud computing company, smart phone, web portal.

The '241 Patent defines truck, van, automobile, low flying aircraft, helicopter, laptop, PDA, or hand-held electronic device computer which is not a cell phone (Exhibit D). POSITAs would view the arguments by Joseph Paradiso as not meeting the clear and convincing standard for anticipation.

**b. PATENTABLE FEATURES IN THE '837 INDEPENDENT CLAIM 42 PATENT NOT DISCLOSED BY SABERI**

The Saberi '241 Patent, and other priority art patents, does not disclose any of the following claim limitations. Without disclosure of these limitations with clear and convincing evidence, the '837 Claims are valid.

d) one or more wireless communication technologies comprising at 1east one of LoRa, a Sigfox, an U1tra Narrow Band (UNB), a 6LoWPAN, a NB-IoT, or a 4G/LTE-M cellular technology, or any combination thereof;

e) wherein the one or more wireless communication technologies utilizes authentication and encryption technologies for pairing operations and to prevent unauthorized access to a water data

or information (with communication hub utilizes encryption to transfer the water data to a remote computers or servers or a cloud computing company).

f) wherein the one or more wireless communication technologies comprising at least one of the LoRa, the Sigfox, the Ultra Narrow Band (UNB), the 6LoWPAN, the WiMAX, the NB-loT, the 3GPP cellular, the 4G/LTE-M cellular, or the 5G cellular technology, or any combination thereof, consists of a duplex technology to transmit the water use data, the water energy use data, the water quality data, or the leak detection information, or any combination thereof, and send commands to regulate the water control valve mechanism;

the CPU, the microprocessor, or the microcontroller, or any combination thereof, includes at least one of a programming setting managed by a user to remotely set a mode setting or modify a default setting processed by a manufacturer to:

a) record a water flow event to an integrated memory bank or a removable memory device for analysis;

b) combine a plurality of water flow events into the integrated memory bank and subsequently schedule the transfer of the water flow events to a one or more remote computers or servers or to a cloud computing company;

c) transfer the water flow event to the one or more remote computers or servers or to the cloud computing company,

d) transfer the water data or information utilizing a blockchain technology to the one or more remote computers or servers or to the cloud computing company,

e) modify water units or timing units,

f) establish alarm set points; or any combination thereof;

**b.** DEPENDENT CLAIM 47 OF U.S. PATENT 11,549,837

Number 1 and Paragraphs 130 to 133 of Opening Expert Report

Original claim: ~~A water meter and leak detection system as recited in claim 42, wherein an owner or user can communicate with at least one of a smart phone, computer, server, tablet, web portal and one or more other electronic communication devices that includes a software program application capable of displaying an icon, menu, or submenu at least one function of:~~

Certificate of Correction: A water meter and leak detection system as recited in claim 42, wherein an owner or the user communicates with at least one of the smart phone, the computer, the server, the tablet, the web portal, or the other electronic communication device that includes a software program displaying an icon, a menu, or a sub menu that provides at least one function of:

Joseph Paradiso stated that ""[a] remote coordinator 104 may
be a fixed staffed position including but not limited to control room. In another embodiment, a remote coordinator 104 may be a fixed automated position including but not limited to a control box or control panel. In still another embodiment, the remote coordinator 104 may be mobile including but not limited to truck, van, automobile, low flying aircraft, helicopter, laptop, PDA, or hand-held electronic device computer." (Id. at 25:52-60.) See also id. at 27:44-51."

RESPONSE - Here again and throughout the Opening Expert Report by Joseph Paradiso, the claims and specification of the Certificate of Correction were ignored; Joseph Paradiso's analyses and conclusions were made with regard to outdated claim language.

Number 2 and Paragraphs 134 to 142 of Opening Expert Report

Original claim: ~~(a) providing a graphical display of at least one of water use history, water energy usage history, and water quality history from a selected water fixture or water appliance, said history transferred from at least one of said base station, said remote central computer and the cloud service provider or web-based computer; (b) displaying an alarm condition based on one of said water use history, water energy usage history, or water quality history programmed into said base station; (c) turning on or off the water supply by sending a command signal~~

~~transferred to the base station; (d) showing or modifying a program, setting, or a default menu incorporated within the base station; (e) Specifying the water control valve mechanism operational position by sending a request to the base station; (f) downloading updates or regional water rates into the base station; and (g) programming a vacation or work water schedule into the base station~~

Certificate of Correction:

(a) providing a graphical display of at least one of the water use data, the water energy use data, or the water quality data, or any combination thereof, from a selected water fixture or a water appliance, the water data or in-formation transferred from at least one of the base station, a remote central computer, or the cloud computing company,

(b) displaying an alarm condition based on one of the water use data, the water energy use data, or the water quality data, or any combination thereof, and programmed into the base station;

(c) turning on or off a water supply by sending a command signal to the base station;

(d) showing or modifying the software program, a setting, or a default menu included within the base station

(e) identifying an operational position of the water control valve mechanism by sending a request to

the base station;

(f)) downloading updates or regional water rates into the base station; or

(g) programming a vacation or work water schedule into the base station.

RESPONSE – Here again and throughout the Opening Expert Report by Joseph Paradiso, the claims and specification of the Certificate of Correction were ignored; Joseph Paradiso's analyses and conclusions were made with regard to outdated claim language.

Joseph Paradiso did not present his arguments in logical order in the opening expert report paragraphs 134 to 142, so the Plaintiff has reorganized and presented rebuttals in logical order of Claim 42 of the '837 Patent (a to g below).

(a) providing a graphical display of at least one of the water use data, the water energy use data, or the water quality data, or any combination thereof, from a selected water fixture or a

water appliance, the water data or information transferred from at least one of the base station, a remote central computer, or the cloud computing company, (*Emphasis added.*)

The Saberi '241 Patent does not disclose the following underlined limitations or elements in {a) below (one of the water use data, the water energy use data or the water quality data or any combination thereof, from a selected water fixture of a water appliance ... remote central computer or the cloud computing company,

Joseph Paradiso states that in regards to (b), "The remote coordinator 104 may communicate[] with the control unit 106 where resides the user interface that may issue[] command messages and responses to alarm messages." (Id. at 33:48-51.) For example, Saberi teaches that "[a] user interface 216 may be coupled to the processing module to may allow a user to control the remote coordinator 104 and may comprise a display." (Id. at 24:34-36.) "Node 101 to Remote Coordinator 104: In a further embodiment, a node 101 may use this path during construction of the path trace, to report alarms, or meter status. Message may use this path are acknowledged with a remote coordinator 104-to-node 101 ACKNOWLEDGE message." (Id. at 35:7-12.) "Checks for Leaks If the volume of water being used may be unusually high for a long period of time (user settable threshold) an alarm may be generated." (Id. at 37:7-9.) See also id. at 46:27-29. "In a further embodiment, messages are prorogated to a remote coordinator 104.... Additionally, alarm messages including water leak messages." (Id. at 46:37-42.)

(b) displaying an alarm condition based on one of the water use data, the water energy use data, or the water quality data, or any combination thereof, and programmed into the base station; (emphasis added)

RESPONSE - Water use data can be used for more than leaks, and leaks are not mentioned for this limitation. Water energy use (the ratio of cold to hot water) is an indication of shower, dishwasher and washing machine use not disclosed in the Saberi '241 Patent. Water quality is used to monitor hard water, metallic ions, pH issues, and TDS. Not one of these issue is disclosed or claimed address the limitation as defined in (b) in the Saberi '241 Patent.

(c) turning on or off a water supply by sending a command signal to the base station;

Joseph Paradiso states that in regards to (c), "[The] COMMAND message may include a message to open or close a valve...." (Id. at 43:5-14.) a user to control the control unit 106 and may comprise a display, keyboard, or USB port." (Id. at 27:40-43.) In some embodiments, the CIS Server may generate a COMMAND message to disconnect meter by closing a valve or switch, reconnect meter by opening a water valve 302, gas valve 402 or switch 502...." (Id. at 27:22- 33.)

RESPONSE - Since the "valve" is not defined in the '241 Patent at 43:5-14. (as being a water valve 302 or a gas valve 402). Hence a POSITA would consider the term "valve" as vague since it does not apply to a specific type of valve and could apply to a gas or a water valve. A water valve can be a standard solenoid or control valve, but a gas valve must be designed to not cause the gas to ignite. The specification, which is an omnibus specification of an electrical meter, a gas meter and a water meter, begins with disclosing water meter at 19:1 and transitions to gas meters at 22:19; so it appears the vague "valve" if the gas valve. In addition, referring to the '241 Patent at 10:55-62, 27:30-35 causes the POSITA some confusion by stating "The COMMAND message to disconnect [the] meter by closing a valve or switch" is not logical in terms of water because closing the valve turns off the water supply; it does not "disconnect" the meter. Likewise "reconnect the meter by opening the water valve 302, gas valve 402," is not logical because opening the water valve allows water (or gas) to flow though the meter; it does not "reconnect" the water meter. (emphasis added) The omnibus '241 Patent has problematic definition and description of terms used for electric meters, gas meters and water meters. For example, "disconnect" and "reconnecting" applies to electricity meters, not to gas or water meters.

(d) showing or modifying the software program, a setting, or a default menu included within the base station;

RESPONSE – The Saberi '241 Patent does not disclose modifying a software program, a setting or a default menu included within the base station.

(f) downloading updates or regional water rates into the base station; or

RESPONSE – The Saberi '241 Patent does not disclose updating regional water rates into a base station as claimed in the '837 Patent.

(g) programming a vacation or work water schedule into the base station.

Per the opening expert report, "Table 1 Saberi discloses various messages that can be sent to a node 101 by a remote coordinator, for example, that show or modify a program, setting, or a default menu incorporated within the base station, including at least GET SOFTWARE VERSION, SET SENSOR UNITS, SET RF TRANSMIT POWER, SET PASSWORD, SET ENCRYPTION KEY, SET PANID, GET PANID, GET CHANNEL, GET CHANNEL MASK, GET NET STATUS, GET PARENT, GET CHILDREN, SET AUTO JOIN, SET SLEEP DELAY, SLEEP NOW (FORCE SLEEP), GET ROLE, SET ROUTE, SET TRACKING PERIOD, SET ADDRESS MODE PING, SET WAIT TIMEOUT, GET WAIT TIMEOUT, SET REP COUNT, GET REP COUNT, SET MESSAGE LOADOUT TIMEOUT, SET LOGICAL ADDRESS, GET LOGICAL ADDRESS, TIMING PROTOCOL."

RESPONSE – The vacation mode defines in the '837 specification does not perform any sleeping modes or any of the other described terms in the listing above but inhibits the control valve from turning on or off according to programmed instructions (e.g. turn on the water control valve mechanism for irrigation every day from 6:30 a.m. to 8:00 am then turn off the water control valve mechanism). A sleeping mode, as defined above, would turn off the microprocessor and wireless technology and thus if a leak develops, then the '241 Patent's sleeping mode may miss rapid detection of a the leak condition.

Again, POSITAs would view the arguments by Joseph Paradiso as not meeting the clear and convincing standard for anticipation.

The '837 Patent Dependent Claim 47 is patentable because Independent Claim 42 is patentable over the '241 Patent.

c. DEPENDENT CLAIM 48 OF U.S. PATENT 11,549,837

Number 1, Paragraphs 143 to 151 of Opening Expert Report

Original Claim: ~~A water meter and leak detection system as recited in claim 42, wherein one of collection nodes are capable of including at least one of a mesh and/or and peer-to-peer technology circuitry that can communicate with at least one of another water meter collection nodes and communication hubs~~.

Certificate of Correction: A water meter and leak detection system as recited in claim 45, wherein the base station includes at least one of a mesh or a peer-to-peer technology circuitry that communicates with a one or more base stations or the one or more communication hubs.

RESPONSE - Here again and throughout the Opening Expert Report by Joseph Paradiso, the claims and specification of the Certificate of Correction were ignored; Joseph Paradiso's analyses and conclusions were made with regard to outdated claim language.

In addition, the specification of the '837 patent defines the function of the communication hub which the '241 Patent node does not disclose or claim. As the limitation or element must be interpreted by the specification, these functions perform as shown below (taken from the '837 original specification).

'837 Patent at 1:67-2:1 - Use of the optional communication hub or receiving station provides longer wireless range capability

'837 at Patent 2:12-24 - In one embodiment, the water meter collection node utilizes a LoRa, WIMAX, 6LoWPAN, ultra narrow band (UNB), or NB-IoT radio that communications with the optional communication hub or receiving station that has a corresponding LoRa, WiMAX, 6LoWPAN, ultra narrow band (UNB), or NB-IoT radio that communications with the collection node, and the optional communication hub has a second radio with a Wi-Fi or Wi-Fi3 technology that communicates with a wireless router. In addition, the communication

hub can be hard-wired to a wireless router using the ethernet ports. Bluetooth, Bluetooth low energy {BLE), Zigbee or Z-Wave can also be used for shorter range communications.

‘837 Patent at 20:27-29 “The water meter collection node communicates wirelessly with the communication hub which can extend the wireless range of the wireless technology.”

‘837 Patent at 12:48-55 The water parameter information can also be uploaded, either with the use of an optional communication hub or receiving station to an internet router using wired or wireless technology which transmits the data through remote servers (for example, Amazon Web Services, Oracle Cloud, Microsoft Azure Cloud) and associated database(s) or, alternately, through a private or commercial network with privately own servers.

‘837 Patent at 13:5-11; It is anticipated that WIMAX, LoRa, Ultra Narrow Band (UNB), 3GPP, and/or cellular LTE-M, NB-IoT and 5G technology might be necessary for longer distance communication using long range, low power, and/or high-density technology that can communicate with one or more communication hubs. The electronic communication comprises, in part, a segment of the internet of things (IoT) concept. The wireless (or wired) communication means 52 can also electronically communicate with a local router, which uses the internet and remote computer server(s) (Cloud technology) to provide remote access of the water data.

The 241 Patent nodes do not disclose or claim to extend the wireless range of wireless communication technology. Also, the ‘241 Patent nodes do not disclose or claim to have a second Wi-Fi or Wi-Fi3 radio for communication with a residential or corporate router. Further, the ‘241 Patent node do not disclose or claim the associated of transmitting water data through a residential or corporate router to a remote computer server(s) (Cloud Technology) or disclose or claim an internet router using wireless technology which transmits the data through remote servers (for example, Amazon Web Services, Oracle Cloud, Microsoft Azure Cloud) and associated database(s) or, alternately, through a private or commercial network with privately own servers. POSITAs would view the arguments by Joseph Paradiso as not meeting the clear and convincing standard for anticipation.

Dependent Claim 48 is patentable as Independent Claim 42 is patentable.

d. DEPENDENT CLAIM 49 OF U.S. PATENT 11,549,837

Number 1, Paragraphs 152 to 153 of Opening Expert Report

Original Claim: ~~A water meter and leak detection system as recited in claim 42, wherein one of more communication hubs are capable of including at least one of a mesh and/or and peer-to-peer technology circuitry that can communicate with at least one of another water meter collection nodes and communication hubs~~.

Certificate of Correction: A water meter and leak detection system as recited in Claim 45, wherein the one or more communication hubs include at least one of a mesh or a peer-to-peer technology circuitry that communicates with a one or more base stations.

RESPONSE - Here again and throughout the Opening Expert Report by Joseph Paradiso, the claims and specification of the Certificate of Correction were ignored; Joseph Paradiso's analyses and conclusions were made with regard to outdated claim language.

The Certification of Correction cleared up the "and/or" conjunction with correct "or" conjunction. The Saberi '241 Patent does not disclose one or more communication hubs including mesh or peer-to-peer technology to communicate with one or more base stations. The Saberi '241 Patent nodes do not disclose or claim to extend the wireless range of wireless communication technology. Also, the Saberi '241 Patent nodes do not disclose or claim to have a second Wi-Fi or Wi-Fi3 radio for communication with a residential or corporate router. POSITAs would view the arguments by Joseph Paradiso as not meeting the clear and convincing standard for anticipation.

Dependent Claim 49 is patentable as Independent Claim 42 is Patentable.

**c. KLICPERA PATENT NO. 11,549,837**

REBUTTAL TO:

B. The Asserted Claims are Anticipated by U.S. Patent Publication No.2016/0163177 to Klicpera ("Klicpera")

i. Overview of Klicpera

Paragraphs 154 to 155 of Opening Expert Report

RESPONSE - Joseph Paradiso apparently does not understand USPTO policies. The '837 Patent is a CIP of U.S. Patent Application Ser. No. 15/016,178 filed on February 4, 2016, which is U.S. Parent Publication No. 2016-016377 A1 and is incorporated by reference herein its entirety. Joseph Paradiso concludes that "The Asserted Claims are Anticipated by U.S Parent Publication No. 2016-016377 A1 to Klicpera ("Klicpera"). However, the expert Witness again is incorrect as to this USPTO policy as detailed below.

U.S. Pat. Pub. No. 2016/0163177 Al ("the '177 Reference") is not valid prior art to the '837 Patent under 35 U.S.C. § 102(b)(2), which states:

DISCLOSURES APPEARING IN APPLICATIONS AND PATENTS —

A disclosure shall not be prior art to a claimed invention under subsection (a)(2) if—

(A) the subject matter disclosed was obtained directly or indirectly from the inventor or a joint inventor;

(B) the subject matter disclosed had, before such subject matter was effectively filed under subsection (a)(2), been publicly disclosed by the inventor or a joint inventor or another who obtained the subject matter disclosed directly or indirectly from the inventor or a joint inventor; or

(C) the subject matter disclosed and the claimed invention, not later than the effective filing date of the claimed invention, were owned by the same person or subject to an obligation of assignment to the same person.

The '837 Patent's Application No. 16/356,870 is a CIP of the '177 Reference's Application No. 15/016,178, which appears on the face of the '837 Patent. The '177 reference and its application have the same named inventor as the '837 Patent.

B. THE ASSERTED CLAIMS ARE ANTICIPATED BY U.S. PATENT PUBLICATION NO.2016/0163177 TO KLICPERA ("KLICPERA").

REBUTTAL TO:

B. The Asserted Claims are Anticipated by U.S. Patent Publication No.2016/0163177 to Klicpera ("Klicpera")

ii. Anticipation of the Asserted Claims by Klicpera

Paragraphs 154 to 155 of Opening Expert Report

RESPONSE - Mr. Joseph Paradiso apparently does not understand USPTO policies. The '837 Patent is a continuation in part of U.S. Patent Application Ser. No. 15/016,178 filed on February 4, 2016, which is U.S. Parent Publication No. 2016-016377 A1 and is incorporated by reference herein its entirety. Mr. Joseph Paradiso concludes that "The Asserted Claims are Anticipated by U.S Parent Publication No. 2016-016377 A1 to Klicpera ("Klicpera"). However, the expert Witness again is incorrect as to this USPTO policy as detailed below.

U.S. Pat. Pub. No. 2016/0163177 Al ("the '177 Reference") is not valid prior art to the '837 Patent under 35 U.S.C. § 102(b)(2), which states:

DISCLOSURES APPEARING IN APPLICATIONS AND PATENTS —

A disclosure shall not be prior art to a claimed invention under subsection (a)(2) if—

(A) the subject matter disclosed was obtained directly or indirectly from the inventor or a joint inventor;

(B) the subject matter disclosed had, before such subject matter was effectively filed under subsection (a)(2), been publicly disclosed by the inventor or a joint inventor or another who obtained the subject matter disclosed directly or indirectly from the inventor or a joint inventor; or

(C) the subject matter disclosed and the claimed invention, not later than the effective filing date of the claimed invention, were owned by the same person or subject to an obligation of assignment to the same person.

The ’837 Patent’s Application No. 16/356,870 is a CIP of the ’177 Reference’s Application No. 15/016,178, which appears on the face of the ’837 Patent. The ’177 reference and its application have the same named inventor as the ’837 Patent.

ii. ANTICIPATION OF THE ASSERTED CLAIMS BY KLICPERA

a. Claim 42 OF U.S. PATENT 11,549,837

Number 1, Paragraphs 156 to 157 of Opening Expert Report

RESPONSE - The expert witness is incorrect about the priority date of the ‘837 Patent. The 11,549,837 Patent’s Application No. 16/356,870 is a CIP of Application No. 15/016,178, (now issued patent 10,410,501) which appears on the face of the ’837 Patent. All patent language disclosed and claimed in the ‘178 Patent Application of the received the priority date of filed on February 4, 2016. Furthermore, the ‘501 patent (or ‘178 patent application) is a CIP of the parent application 13/776,963, filed on Feb 26, 2013, now Pat. No. 9,297,150. All patent language disclosed and claimed in the ‘963 Patent Application of the received the

priority date of filed on Feb. 26, 2013. The expert witness Joseph Paradiso did not understand that analysis of the priority date is not a simple or single date for CIPs.

Number 2, Paragraphs 158 to 161 of Opening Expert Report

Original Claim: ~~a base station having a water control mechanism interposed between a main water supply line and a water supply for a building or structure~~;

Certificate of Correction: a base station having a water control valve mechanism interposed between a main water source and a water supply line for a building or a structure;

RESPONSE - Here again and throughout the Opening Expert Report by Joseph Paradiso, the claims and specification of the CofC were ignored; Joseph Paradiso's analyses and conclusions were made with regard to outdated claim language.

35 U.S.C. 102 (b)(2) DISCLOSURES APPEARING IN APPLICATIONS AND PATENTS — A disclosure shall not be prior art to a claimed invention under subsection (a)(2) if—

(A) the subject matter disclosed was obtained directly or indirectly from the inventor or a joint inventor;

(B) the subject matter disclosed had, before such subject matter was effectively filed under subsection (a)(2), been publicly disclosed by the inventor or a joint inventor or another who obtained the subject matter disclosed directly or indirectly from the inventor or a joint inventor; or

(C) the subject matter disclosed and the claimed invention, not later than the effective filing date of the claimed invention, were owned by the same person or subject to an obligation of assignment to the same person.

Number 3, Paragraphs 162 to 164 of Opening Expert Report

Original Claim: ~~said base station further comprising; a) electrical circuitry including at least one of a CPU, microprocessor and microcontroller with a power source;~~

Certificate of Correction: a) an electrical circuitry including at least one of a CPU, a microprocessor, or a microcontroller, or any combination thereof;

RESPONSE - Here again and throughout the Opening Expert Report by Joseph Paradiso, the claims and specification of the CofC were ignored; Joseph Paradiso's analyses and conclusions were made with regard to outdated claim language.

35 U.S.C. 102 (b)(2) DISCLOSURES APPEARING IN APPLICATIONS AND PATENTS — A disclosure shall not be prior art to a claimed invention under subsection (a)(2) if—

(A) the subject matter disclosed was obtained directly or indirectly from the inventor or a joint inventor;

(B) the subject matter disclosed had, before such subject matter was effectively filed under subsection (a)(2), been publicly disclosed by the inventor or a joint inventor or another who obtained the subject matter disclosed directly or indirectly from the inventor or a joint inventor; or

(C) the subject matter disclosed and the claimed invention, not later than the effective filing date of the claimed invention, were owned by the same person or subject to an obligation of assignment to the same person.

Number 4, Paragraphs 165 to 167 of Opening Expert Report Original Claim: ~~b) one or more flow rate sensor connected to the main water supply and connected to said electrical circuitry and designed to monitor at least one of a water use data, water energy use data, water quality data and leak detection information from said building or structure, said one or more flow rate sensors connected to the main water supply and connected with said electrical circuitry~~;

Certificate of Correction: b) one or more flow rate sensors connected to the water supply line and designed to monitor at least one or water use data, a water energy use data, a water quality data, or a leak detection information, or any combination thereof, from the building or the structure, the one or more flow rate sensors connected with the electrical circuitry;

RESPONSE - Here again and throughout the Opening Expert Report by Joseph Paradiso, the claims and specification of the CofC were ignored; Joseph Paradiso's analyses and conclusions were made with regard to outdated claim language.

35 U.S.C. 102 (b)(2) DISCLOSURES APPEARING IN APPLICATIONS AND PATENTS — A disclosure shall not be prior art to a claimed invention under subsection (a)(2) if—

(A) the subject matter disclosed was obtained directly or indirectly from the inventor or a joint inventor;

(B) the subject matter disclosed had, before such subject matter was effectively filed under subsection (a)(2), been publicly disclosed by the inventor or a joint inventor or another who obtained the subject matter disclosed directly or indirectly from the inventor or a joint inventor; or

(C) the subject matter disclosed and the claimed invention, not later than the effective filing date of the claimed invention, were owned by the same person or subject to an obligation of assignment to the same person.

Number 5, Paragraphs 168 to 170 of Opening Expert Report

Original Claim: ~~c) said power source that is at least one of an AC powered, DC powered, and one or more standard or rechargeable batteries, said rechargeable batteries capable of being supplemented with a turbine or other rotational mechanism that generates electrical energy said power source is electrically connected to said electrical circuitry;~~

Certificate of Correction: c) a power source that is at least one or an AC powered, a DC powered, or a one or more standard or rechargeable batteries, or any combination thereof, the rechargeable batteries capable of being supplemented with a turbine or other rotational mechanism that generates electrical energy, the power source is electrically connected to the electrical circuitry;

RESPONSE – Here again and throughout the Opening Expert Report by Joseph Paradiso, the claims and specification of the CofC were ignored; Joseph Paradiso's analyses and conclusions were made with regard to outdated claim language.

35 U.S.C. 102 (b)(2) DISCLOSURES APPEARING IN APPLICATIONS AND PATENTS — A disclosure shall not be prior art to a claimed invention under subsection (a)(2) if—

(A) the subject matter disclosed was obtained directly or indirectly from the inventor or a joint inventor;

(B) the subject matter disclosed had, before such subject matter was effectively filed under subsection (a)(2), been publicly disclosed by the inventor or a joint inventor or another who obtained the subject matter disclosed directly or indirectly from the inventor or a joint inventor; or

(C) the subject matter disclosed and the claimed invention, not later than the effective filing date of the claimed invention, were owned by the same person or subject to an obligation of assignment to the same person.

Number 6, Paragraphs 171 to 173 of Opening Expert Report

Original Claim: ~~d) one or more wireless communication technologies comprising at least one of a LoRa, Sigfox, Ultra Narrow Band. 6LowPAN, NB-IoT, LTE-M cellular, and 5G cellular technology~~;

Certificate of Correction: d) one or more wireless communication technologies comprising at 1east one of LoRa, a Sigfox, an U1tra Narrow Band (UNB), a 6LoWPAN, a WiMAX, a NB-IoT, a 3GPP cellular, a 4G/LTE-M cellular, or a 5G cellular technology, or any combination thereof;

RESPONSE – Here again and throughout the Opening Expert Report by Joseph Paradiso, the claims and specification of the CofC were ignored; Joseph Paradiso's analyses and conclusions were made with regard to outdated claim language.

35 U.S.C. 102 (b)(2) DISCLOSURES APPEARING IN APPLICATIONS AND PATENTS — A disclosure shall not be prior art to a claimed
invention under subsection (a)(2) if—

(A) the subject matter disclosed was obtained directly or indirectly from the inventor or a joint inventor;

(B) the subject matter disclosed had, before such subject matter was effectively filed under subsection (a)(2), been publicly disclosed by the inventor or a joint inventor or another who obtained the subject matter disclosed directly or indirectly from the inventor or a joint inventor; or

(C) the subject matter disclosed and the claimed invention, not later than the effective filing date of the claimed invention, were owned by the same person or subject to an obligation of assignment to the same person.

Even if 35 U.S.C. 102(b)(2) did not apply, Klicpera U.S. Patent Publication No.2016/0163177 does not disclose LoRa, Sigfox, UNB, NB-IoT, 6LoWPAN or 4G/LTE. POSITAs would view the arguments by Joseph Paradiso as not meeting the clear and convincing standard for anticipation.

Number 7, Paragraphs 174 to 178 of Opening Expert Report

Original Claim: ~~wherein said one or more wireless communication technologies utilizes authentication and encryption technologies for pairing operations and to prevent unauthorized access to the water data or information; and~~

Certificate of Correction: e) wherein the one or more wireless communication technologies utilizes authentication and encryption technologies for pairing operations and to prevent unauthorized access to a water data or information;

RESPONSE – Here again and throughout the Opening Expert Report by Joseph Paradiso, the claims and specification of the CofC were ignored; Joseph Paradiso's analyses and conclusions were made with regard to outdated claim language.

35 U.S.C. 102 (b)(2) DISCLOSURES APPEARING IN APPLICATIONS AND PATENTS — A disclosure shall not be prior art to a claimed invention under subsection (a)(2) if—

(A) the subject matter disclosed was obtained directly or indirectly from the inventor or a joint inventor;

(B) the subject matter disclosed had, before such subject matter was effectively filed under subsection (a)(2), been publicly disclosed by the inventor or a joint inventor or another who obtained the subject matter disclosed directly or indirectly from the inventor or a joint inventor; or

(C) the subject matter disclosed and the claimed invention, not later than the effective filing date of the claimed invention, were owned by the same person or subject to an obligation of assignment to the same person.

Number 8, Paragraphs 177 to 182 of Opening Expert Report

Original Claim: ~~f) wherein the long-range LoRa, Sigfox, UNB, NB-IoT, 6LoWPAN, WiMAX, cellular technology 3GPP and LTE-M and 5G consist of a duplex technology to both receive at least one of a water use data, water energy use data, water quality data and leak detection information and send commands to regulate the control valve mechanism~~

Certificate of Correction: f) wherein the one or more wireless communication technologies comprising at least one of the LoRa, the Sigfox, the Ultra Narrow Band (UNB), the 6LoWPAN, the WiMAX, the NB-IoT, the 3GPP cellular, the 4G/LTE-M cellular, or the 5G cellular technology, or any combination thereof, consists of a duplex technology to transmit the water use data, the water energy use data, the water quality data, or the leak detection information, or any combination thereof, and send commands to regulate the water control valve mechanism.

RESPONSE – Here again and throughout the Opening Expert Report by Joseph Paradiso, the claims and specification of the CofC were ignored; Joseph Paradiso's analyses and conclusions were made with regard to outdated claim language.

35 U.S.C. 102 (b)(2) DISCLOSURES APPEARING IN APPLICATIONS AND PATENTS — A disclosure shall not be prior art to a claimed invention under subsection (a)(2) if—

(A) the subject matter disclosed was obtained directly or indirectly from the inventor or a joint inventor;

(B) the subject matter disclosed had, before such subject matter was effectively filed under subsection (a)(2), been publicly disclosed by the inventor or a joint inventor or another who obtained the subject matter disclosed directly or indirectly from the inventor or a joint inventor; or

(C) the subject matter disclosed and the claimed invention, not later than the effective filing date of the claimed invention, were owned by the same person or subject to an obligation of assignment to the same person.

Even if 35 U.S.C. 102(b)(2) did not apply, Klicpera U.S. Patent Publication No.2016/0163177 does not disclose LoRa, Sigfox, UNB, NB-IoT, 6LoWPAN or 4G/LTE. POSITAs would view the arguments by Joseph Paradiso as not meeting the clear and convincing standard for anticipation.

Number 9, Paragraphs 183 to 194 of Opening Expert Report

Original Claim: ~~the CPU, microprocessor or microcontroller can at least include one of a programming setting managed by the user, remotely a mode setting, and a default or restricted setting processed by the manufacturing factory to: a) record the water flow event to a local memory bank or removable memory device for regional or controlled analysis, b) combine a plurality of water low events into a local memory bank and subsequently schedule the transfer of the water flow event dataset to a remote computer or server, or to a cloud service company, c) directly transfer the water .flow event to a remote computer or server, or to a cloud service company, or d) transfer the water flow data utilizing a blockchain format to one or more remote computers or servers, or cloud service company; and~~

Certificate of Correction: the CPU, the microprocessor, or the microcontroller, or any combination thereof, includes at least one of a programming setting managed by a user to remotely set a mode setting or modify a default setting processed by a manufacturer to:

a) record a water flow event to an integrated memory bank or a removable memory device for analysis;

b) combine a plurality of water flow events into the integrated memory bank and subsequently schedule the transfer of the water flow events to a one or more remote computers or servers or to a cloud computing company;

c) transfer the water flow event to the one or more remote computers or servers or to the cloud computing company,

d) transfer the water data or information utilizing a blockchain technology to the one or more remote computers or servers or to the cloud computing company,

e) modify water units or timing units,

f) establish alarm set points;
or any combination thereof;

RESPONSE – Here again and throughout the Opening Expert Report by Joseph Paradiso, the claims and specification of the CofC were ignored; Joseph Paradiso's analyses and conclusions were made with regard to outdated claim language.

35 U.S.C. 102 (b)(2) DISCLOSURES APPEARING IN APPLICATIONS AND PATENTS — A disclosure shall not be prior art to a claimed invention under subsection (a)(2) if—

(A) the subject matter disclosed was obtained directly or indirectly from the inventor or a joint inventor;

(B) the subject matter disclosed had, before such subject matter was effectively filed under subsection (a)(2), been publicly disclosed by the inventor or a joint inventor or another who obtained the subject matter disclosed directly or indirectly from the inventor or a joint inventor; or

(C) the subject matter disclosed and the claimed invention, not later than the effective filing date of the claimed invention, were owned by the same person or subject to an obligation of assignment to the same person.

Even if 102(b)(2) does not apply, U.S. Pat. Pub. No. 2016/0163177 Al does not disclose blockchain technology. POSITAs would view the arguments by Joseph Paradiso as not meeting the clear and convincing standard for anticipation.

Number 10, Paragraphs 195 to 201 of Opening Expert Report Original Claim: ~~the one or more wireless communication technologies capable of transmitting at least one of a 1) water use data, water energy use data, water quality data and leak detection information and, 2) obtains an instruction or signal to command the management of the water control valve or perform a command operation, using at least one of an Internet connection, a private network system, and a corporate owned network system, and a smart phone, computer, server, tablet, web portal, and other electronic communication device, that communicates with at least one of a remote computer or server, a commercial cloud company, and a web-based company.~~

Certificate of Correction: the one or more wireless communication technologies configured to:

(i) transmit at least one of the water use data, the water energy use data, the water quality data, or the leak detection information, or any combination thereof, to the one or more remote computers or servers or to the cloud computing company; and

(ii) receive an instruction or signal to command the management of the water control valve mechanism or perform another command operation;

using at least one of an Internet connection, a private network system, or a corporate owned network system that communicates with a smart phone, a computer, a server, a tablet, a web portal, or another electronic communication device.

RESPONSE – Here again and throughout the Opening Expert Report by Joseph Paradiso, the claims and specification of the Certificate of Correction were ignored; Joseph Paradiso's analyses and conclusions were made with regard to outdated claim language.

35 U.S.C. 102 (b)(2) DISCLOSURES APPEARING IN APPLICATIONS AND PATENTS — A disclosure shall not be prior art to a claimed invention under subsection (a)(2) if—

(A) the subject matter disclosed was obtained directly or indirectly from the inventor or a joint inventor;

(B) the subject matter disclosed had, before such subject matter was effectively filed under subsection (a)(2), been publicly disclosed by the inventor or a joint inventor or another who obtained the subject matter disclosed directly or indirectly from the inventor or a joint inventor; or

(C) the subject matter disclosed and the claimed invention, not later than the effective filing date of the claimed invention, were owned by the same person or subject to an obligation of assignment to the same person.

b. Claim 47 of U.S. Patent 11,549,837

Numbers 1, Paragraph 203 of Opening Expert Report

Original Claim: ~~A water meter and leak detection system as recited in claim 42, wherein an owner or user can communicate with at least one of a smart phone, computer, server, tablet, web portal and one or more other electronic communication devices that includes a software program application capable of displaying an icon, menu, or submenu at least one function of:~~
Certificate of Correction: A water meter and leak detection system as recited in claim 42, wherein an owner or the user communicates with at least one of the smart phone, the computer, the server, the tablet, the web portal, or the other electronic communication device that includes a software program displaying an icon, a menu, or a sub menu that provides at least one function of:

Numbers 2, Paragraphs 204 to 214 of Opening Expert Report
Original Claim: ~~(a) providing a graphical display of at least one of water use history, water energy usage history, and water quality history from a selected water fixture or water appliance, said history transferred from at least one of said base station, said remote central computer and the cloud service provider or web-based computer; (b) displaying an alarm condition based on one of said water use history, water energy usage history, or water quality history programmed into said base station; (c) turning on or off the water supply by sending a command signal transferred to the base station; (d) showing or modifying a program, setting, or a default menu incorporated within the base station; (e) Specifying the water control valve mechanism operational position by sending a request to the base station; (f) downloading updates or regional water rates into the base station; and (g) programming a vacation or work water schedule into the base station~~
Certificate of Correction:
(a) providing a graphical display of at least one of the water use data, the water energy use data, or the water quality data, or any combination thereof, from a selected water fixture or a water appliance, the water data or information transferred from at least one of the base station, a remote central computer, or the cloud computing company,

(b) displaying an alarm condition based on one of the water use data, the water energy use data, or the water quality data, or any combination thereof, and programmed into the base station;

(c) turning on or off a water supply by sending a command signal to the base station;

(d) showing or modifying the software program, a setting, or a default menu included within the base station,

(e) identifying an operational position of the water control valve mechanism by sending a request to the base station;

(f)) downloading updates or regional water rates into the base station; or

(g) programming a vacation or work water schedule into the base station.

RESPONSE – Here again and throughout the Opening Expert Report by Joseph Paradiso, the claims and specification of the Certificate of Correction were ignored; Joseph Paradiso's analyses and conclusions were made with regard to outdated claim language

35 U.S.C. 102 (b)(2) DISCLOSURES APPEARING IN APPLICATIONS AND PATENTS — A disclosure shall not be prior art to a claimed invention under subsection (a)(2) if—

(A) the subject matter disclosed was obtained directly or indirectly from the inventor or a joint inventor;

(B) the subject matter disclosed had, before such subject matter was effectively filed under subsection (a)(2), been publicly disclosed by the inventor or a joint inventor or another who obtained the subject matter disclosed directly or indirectly from the inventor or a joint inventor; or

(C) the subject matter disclosed and the claimed invention, not later than the effective filing date of the claimed invention, were owned by the same person or subject to an obligation of assignment to the same person.

Dependent Claim 47 is patentable as Independent Claim 42 is patentable over Klicpera.

c. Claim 48 OF U.S. PATENT 11,549,837

Number 1, Paragraphs 216 to 218 of Opening Expert Report

Original Claim: ~~A water meter and leak detection system as recited in claim 42, wherein one of collection nodes are capable of including at least one of a mesh and/or and peer-to-peer~~

~~technology circuitry that can communicate with at least one of another water meter collection nodes and communication hubs~~. Certificate of Correction: A water meter and leak detection system as recited in claim 45, wherein the base station includes at least one of a mesh or a peer-to-peer technology circuitry that communicates with a one or more base stations or the one or more communication hubs.

RESPONSE – Here again and throughout the Opening Expert Report by Joseph Paradiso, the claims and specification of the Certificate of Correction were ignored; Joseph Paradiso's analyses and conclusions were made with regard to outdated claim language.

35 U.S.C. 102 (b)(2) DISCLOSURES APPEARING IN APPLICATIONS AND PATENTS — A disclosure shall not be prior art to a claimed invention under subsection (a)(2) if—

(A) the subject matter disclosed was obtained directly or indirectly from the inventor or a joint inventor;

(B) the subject matter disclosed had, before such subject matter was effectively filed under subsection (a)(2), been publicly disclosed by the inventor or a joint inventor or another who obtained the subject matter disclosed directly or indirectly from the inventor or a joint inventor; or

(C) the subject matter disclosed and the claimed invention, not later than the effective filing date of the claimed invention, were owned by the same person or subject to an obligation of assignment to the same person.

Dependent Claim 48 is patentable as Independent Claim 42 is patentable over Klicpera.

Claim 49 OF U.S. PATENT 11,549,837

Number 1, Paragraphs 219 to 220 of Opening Expert Report

Original Claim: ~~A water meter and leak detection system as recited in claim 42, wherein one of more communication hubs are capable of including at least one of a mesh and/or and peer-to-peer technology circuitry that can communicate with at least one of another water meter collection nodes and communication hubs~~.

Certificate of Correction: A water meter and leak detection system as recited in claim 45, wherein the one or more communication hubs includes at least one of a mesh or a peer-to-peer technology circuitry that communicates with a one or more base stations.

RESPONSE - Here again and throughout the Opening Expert Report by Joseph Paradiso, the claims and specification of the Certificate of Correction were ignored; Joseph Paradiso's analyses and conclusions were made with regard to outdated claim language.

35 U.S.C. 102 (b)(2) DISCLOSURES APPEARING IN APPLICATIONS AND PATENTS — A disclosure shall not be prior art to a claimed invention under subsection (a)(2) if—

(A) the subject matter disclosed was obtained directly or indirectly from the inventor or a joint inventor;

(B) the subject matter disclosed had, before such subject matter was effectively filed under subsection (a)(2), been publicly disclosed by the inventor or a joint inventor or another who obtained the subject matter disclosed directly or indirectly from the inventor or a joint inventor; or

(C) the subject matter disclosed and the claimed invention, not later than the effective filing date of the claimed invention, were owned by the same person or subject to an obligation of assignment to the same person.

Dependent Claim 49 is patentable as Independent Claim 42 is patentable over Klicpera.

**d. REBUTTAL TO: C. Secondary Considerations**

Paragraph 222 of Opening Expert Report

Joseph Paradiso stated, "Mueller's Interrogatory No. 7 asked Rein Tech to "explain in detail each objective indicium of non-obviousness, if any, that Rein Tech contends supports the validity of the claim...." Rein Tech answer to Interrogatory No. 7 states that "Plaintiff will respond to this Interrogatory at the time when its validity contentions are due under the Court's Scheduling Order." I understand that Rein Tech did not supplement or amend its response with any responsive information or references to any documents."

RESPONSE - Plaintiff responded to Defendant's Interrogatories and Request for Production of Documents, by providing complete emails from Rein Tech's engineering team; engineering drawings; disclosure book pages, and other relevant documentation; and actual water meter test products used in the residential field study including communications hubs. (*See* D.I. 114.)

In contrast, the Defendant provided vague answers to many of the interrogatories and non-answers to critical Interrogatory Numbers 2 and 19. Furthermore, Defendant did not provide any documents in response to Rein Tech's first request for Production of Documents and Mueller completely ignored Rein Tech's second request for Production of Documents. This was completely addressed with extensive exhibits in the Testimony from the Expert Witness by Michael Klicpera where the Defendant attorneys misrepresented that fact that Defendant Mueller had sold "Based on our investigation, which is ongoing, it is our understanding at present that none of Mueller's LoRaWAN and Cellular Node installations to date involve combinations with 420 RDMs and, as such, quarterly and annual gross and net sales in U.S. dollars and quantities sold in and from the United States for the accused products from October 27, 2021, to present: as requested in Document Request No. 2. is $0 for all requested categories, with no responsive documents to produce." The exhibits of the Testimony of Expert Witness Michael Klicpera showed at least 5 large sites that were not disclosed. Then participated in a call with a Mueller representative who stated that 750,000 420RDM water meters have been sold and are in operation in the Unites States. And then the SEC Edgar Mueller Water Products 10Q Quarterly Report for the Quarter Ending on December 31, 2024 showed that Defendant Mueller Water Products had net sales reported at $7,602,000 for 2023 and $9,129,000 for 2024 and gross sales were at $6,029,000 for 2023 and $7,210,000 for 2024.

Paragraph 223 of Opening Expert Report

Joseph Paradiso stated, "Rein Tech's First Supplemental Validity Contentions, served on August 9, 2023, do not identify any objective considerations supporting the alleged non-obviousness of the Asserted Claims."

RESPONSE - The Validity Contention, dated August 9, 2023, focused on the Saberi '241 Patent, Defendant's last attempt to find prior art that might invalidate the '837 patent. And as this Rebuttal to Mueller's Opening Expert Witness Report contends, neither the Saberi '241 Patent nor the prior art discloses or claims that:

one or more wireless communication technologies comprising at 1east one of LoRa, a Sigfox, an U1tra Narrow Band (UNB), a 6LoWPAN, a NB-IoT, or a 4G/LTE-M cellular technology, or any combination thereof;

Water Energy Use as defined in the specification

Water Quality sensors as defined in the specification

wherein the one or more wireless communication technologies utilizes authentication and encryption technologies for pairing operations and to prevent unauthorized access to a water data or information (communication hub utilizes encryption to transfer the water data to a remote computers or servers or a cloud computing company).

wherein the one or more wireless communication technologies comprising at least one of the LoRa, the Sigfox, the Ultra Narrow Band (UNB), the 6LoWPAN, the WiMAX, the NB-loT, the 3GPP cellular, the 4G/LTE-M cellular, or the 5G cellular technology, or any combination thereof, consists of a duplex technology to transmit the water use data, the water energy use data, the water quality data, or the leak detection information, or any combination thereof, and send commands to regulate the water control valve mechanism;

CPU, microprocessor, or microcontroller, or any combination thereof, includes at least one of a programming setting managed by a user to remotely set a mode setting or modify a default setting processed by a manufacturer to:

record the water flow event to a local memory bank or removable memory device for analysis,

combine a plurality of water flow events into a local memory bank and subsequently schedule the transfer of the water flow event dataset to a remote computer or server, or to a cloud service company,

directly transfer the water flow event to a remote computer or server, or to a cloud service company, or

transfer the water flow data utilizing a blockchain format to one or more remote computers or servers, or cloud service company;

modify water units or timing units,

establish alarm set points; or any combination thereof;

POSITAs would view the arguments by Joseph Paradiso as not meeting the clear and convincing standard for invalidity that *i4i* requires.

Paragraph 224 of Opening Expert Report

As demonstrated by the prior art references discussed herein, there was no unsolved need for the claimed subject matter, nor had others failed to solve the problems addressed by the Asserted Claims. Rein Tech has not identified any commercial embodiment of the '837 Patent, and, therefore, Rein Tech cannot rely on any alleged commercial success and nexus to the claimed subject matter. I am also unaware of any copying by Mueller, nor has Rein Tech alleged any copying of the claimed subject matter in its interrogatory responses or validity contentions

RESPONSE - Plaintiff has developed a superior water meter over Mueller's water meter products and has proved its functionality in residential field study. The Plaintiff wanted the residential owner or corporate owner to have real-time access to their water use. And with the water flow event use monitoring, rapid determination of leaks can be determined, saving significant damage and costs. Instead of licensing the Plaintiff's patent portfolio, the Defendant has fought the Plaintiff in various proceedings and asserted that Plaintiff's patents

are invalid, causing the Plaintiff to go through USPTO Trial and Appeal proceedings, Reexamination proceedings, and now a trial proceeding. However, Rein Tech is continuing in its water meter development to reduce its footprint, develop its own ultrasonic flow sensor, and improving its software and cell phone APP. Plaintiff continues to contend that Defendant Mueller is infringing the '837 patent.

**8. REBUTTAL TO: X. THE ASSERTED CLAIMS FAIL TO SATISFY THE WRITTEN DESCRIPTION REQUIREMENT**

A. CLAIMS 42 AND 47-49 OF THE '837 PATENT ARE INVALID AS FOR FAILING TO SATISFY THE WRITTEN DESCRIPTION REQUIREMENT UNDER 35 U.S.C. § 112.

Paragraph 226 of Opening Expert Report

Joseph Paradiso incorrectly stated that the '837 Patent, "send commands to regulate the control valve mechanism [of the base station]." The specification of the '837 Patent as originally filed (as well as the specification as issued) discloses a base station that includes wireless communication technologies that *receive* commands for controlling the control valve mechanism of the base station, but it does not disclose wireless communication technologies that *send* commands for controlling the control valve mechanism; therefore, a POSA would not understand that the inventor possessed the full scope of the claimed invention."

RESPONSE - The Plaintiff clearly discloses sending commands for controlling the water control valve mechanism in the specification at Fig. 12, 38:19-42, 42:40-67, 43:14-17, 64-67 (Turn of the supply water off). A POSITA would understand from the context of the specification, file history, and the claims that Claim 42 is adequately definite. A POSITA would view the arguments made by Joseph Paradiso as not meeting the clear and convincing standard for invalidity that *i4i* requires.

Paragraph 227 of Opening Expert Report

Joseph Paradiso incorrectly stated that the '837 Patent, ""transfer the water flow data utilizing a blockchain format to one or more remote computers or servers, or cloud service company." "The specification of the '837 Patent as originally filed (as well as the

specification as issued) does not support this limitation; therefore, a POSA would not understand that the inventor possessed the full scope of the claimed invention"

RESPONSE - Here again and throughout the Opening Expert Report by Joseph Paradiso, the claims and specification of the Certificate of Correction were ignored; Joseph Paradiso's analyses and conclusions were made with regard to outdated claim language.

The Certification of Correction now states in the specification at 26:23-40;

Encryption, authentication, integrity and non-repudiation or blockchain may be important characteristics when the water meter and leak detection system 10 (126 shown in FIGS. 6 and 200 shown in FIG. 7) is transferring water use or water quality data or information to a remote server/database via a public or private network that provide wireless subsequent access to registered computers and cell, smart and mobile phones 400." When the water mater and leak detection system 10 (126 shown in FIGS. 6 and 200 shown in FIG. 7) receives or uploads data and information such as a control command signal to send or transmit data and information, it is critical that the device can authenticate the sender and be sure of the integrity of the data and information. Encryption provides privacy by converting the data or in-formation into an "encrypted" code to prevent unauthorized access. Encryption can be provided point-to-point, or end-to-end, and transmit messages using encryption schemes such as Pretty Good Privacy (PGP), Secure/Multipurpose Internet Email (S/M IME), XML, or SSL encryption protocols. Non-repudiation prevents the sender from denying that they sent or received data/in-formation or a message. Non-repudiation can be provided by signing, electronic witnessing and technologies that assert a document was read before it was signed. One of the main advantages of the blockchain technology is that non-repudiation is nearly immutable. Here, the water meter and leak detection system 10 (126 shown in FIGS. 6 and 200 shown in FIG. 7) can include digital signature technology, data packets or messages using PGP, S/M IE, XML and Digital Signature, TLS/SSL and two-step authentication to provide for non-repudiation of those messages, information or data.

A POSITA would use The current claim language defined in the Certificate of Correction and would understand from the context of the specification, file history, and the claims that Claim

42 is adequately definite. A POSITA would view the arguments made by Joseph Paradiso as not meeting the clear and convincing standard for invalidity that *i4i* requires.

Paragraph 228 of Opening Expert Report

The expert witness incorrectly stated that the '837 Patent, "record the water flow event to a local memory bank or removable memory device for regional or controlled analysis. The specification of the '837 Patent as originally filed (as well as the specification as issued) fails to support both the referenced "regional . . . analysis" and "controlled analysis," as well as the performance thereof in conjunction with "a local memory bank or removable memory device; therefore, a POSA would not understand that the inventor possessed the full scope of the claimed invention.

RESPONSE - Here again and throughout the Opening Expert Report by Joseph Paradiso, the claims and specification of the Certificate of Correction were ignored; Joseph Paradiso's analyses and conclusions were made with regard to outdated claim language.

The current Claim 42 presented in the Certificate of Correction for the '837 Patent, reads as shown below:

Original Claim: ~~a) record the water flow event to a local memory bank or removable memory device for regional or controlled analysis,~~

Certificate of Correction: a) record a water flow event to an integrated memory bank or a removable memory device for analysis;

A POSITA would understand from the context of the Certificate of Correction specification, file history, and the claims that Claim 42 is adequately definite. A POSITA would not view the arguments made by Joseph Paradiso as meeting the clear and convincing standard for invalidity that *i4i* requires.

B. CLAIM 47 OF THE '837 PATENT IS INVALID AS FOR FAILING TO SATISFY THE WRITTEN DESCRIPTION REQUIREMENT UNDER 35 U.S.C. § 112.

Paragraph 229 of Opening Expert Report

Joseph Paradiso "asserted Claim 47 of the '837 Patent is invalid under 35 U.S.C. § 112 for failing to be supported by an adequate written description. Asserted Dependent Claim 47 recites "downloading updates or regional water rates into the base station." The specification of the '837 Patent as originally filed (as well as the specification as issued) fails to support "regional water rates" and the downloading thereof into the base station; therefore, a POSA would not understand that the inventor possessed the full scope of the claimed invention."

RESPONSE – Here again and throughout the Opening Expert Report by Joseph Paradiso, the claims and specification of the Certificate of Correction were ignored; Joseph Paradiso's analyses and conclusions were made with regard to outdated claim language.

"Regional water rates" is not an issue as shown by the current claim 42 of the '837 Patent in the Certification of Correction.

a) record a water flow event to an integrated memory bank or a removable memory device for analysis;

A POSITA would understand from the context of the Certificate of Correction specification, file history, and the claims that Claim 42 is adequately definite. In addition, the Certification of Correction reads as follows: "FIG. 11 shows an example of an application or page (APP) 300 for Water Use 302 having a daily 304 graph 306 with day hours 308, designated by the symbol AM 312 and the night hours 310 designated by the symbol PM 314. At the right side of the example application or page (APP) 300 is the daily total use of water 316 and the daily total cost in dollars (or other currency) 318 the weekly total use of water 326 and the weekly total cost in dollars 328, and the monthly total use of water 336 and the monthly total cost in dollars 338 by year 334 per regional water rates that has been downloaded the data 340 from the registered or serving water municipality. Within the daily graph 306 is a plotted Line 307 that shows the hourly water use. The plotted Line 307 can have a rolling feature whereby new data replaces the oldest data in the graph. A gallon or liter scale can be included on the left side of the daily graph 305 (not shown)."

A POSITA would understand from the context of the specification, file history, and the claims that Claim 42 is adequately definite. A POSITA would view the arguments made by Joseph Paradiso as not meeting the clear and convincing standard for invalidity that *i4i* requires.

## 9. REBUTTAL TO: XI. THE ASSERTED CLAIMS ARE INDEFINITE

**A.** CLAIM 42 IS INVALID AS INDEFINITE UNDER 35 U.S.C. § 112.

Paragraph 229 of Opening Expert Report

Joseph Paradiso incorrectly asserted that Claim 47 of the ’837 Patent is invalid under 35 U.S.C. §112 for failing to be supported by an adequate written description. Asserted Dependent Claim 42 recites “downloading updates or regional water rates into the base station.”

RESPONSE - Here again and throughout the Opening Expert Report by Joseph Paradiso, the claims and specification of the Certificate of Correction were ignored; Joseph Paradiso’s analyses and conclusions were made with regard to outdated claim language.

The Certification of Correction now reads:

Column 44, Lines 46-58 now reads as follows: FIG. 11 shows an example of an application or page (APP) 300 for Water Use 302 having a daily 304 graph 306 with day hours 308, designated by the symbol AM 312 and the night hours 310 designated by the symbol PM 314. At the right side of the example application or page (APP) 300 is the daily total use of water 316 and the daily total cost in dollars (or other currency) 318 the weekly total use of water 326 and the weekly total cost in dollars 328, and the monthly total use of water 336 and the monthly total cost in dollars 338 by year 334 per regional water rates that has been downloaded the data 340 from the registered or serving water municipality. Within the daily graph 306 is a plotted Line 307 that shows the hourly water use. The plotted Line 307 can have a rolling "feature whereby new data replaces the oldest data in the graph. A gallon or

liter scale can be included on the left side of the daily graph 305 (not shown). (*underlining added*)

Joseph Paradiso should have used the corrected specification paragraphs of the Certificate of Correction. Joseph Paradiso is not a POSITA like the named inventor and the patent examiner who reviewed and approved patent application. Furthermore, A POSITA would view the arguments made by Joseph Paradiso as not meeting the clear and convincing standard for invalidity that *i4i* requires. For these reasons, Claim 42 in not indefinite under 35 U.S.C §112.

Paragraph 230 of Opening Expert Report

Joseph Paradiso incorrectly stated; "Asserted Independent Claim 42 of the '837 Patent and claims ultimately depending therefrom are indefinite because it is unclear what is meant by "water energy use data." "Water energy use data" is not a term of art that a POSA would understand, and the '837 Patent does not explain what this term means."

RESPONSE - Here again and throughout the Opening Expert Report by Joseph Paradiso, the claims and specification of the Certificate of Correction were ignored; Joseph Paradiso's analyses and conclusions were made with regard to outdated claim language.

It is USPTO policy that the Inventor can be a lexicographer for terms used in the specification. If the expert witness, Joseph Paradiso had read the specification as closely as has for challenging the validity of the '837 patent, he should not have missed paragraph [0045] of the Klicpera U.S. Patent Publication No.2016/0163177, the Parent of the '837 Patent, which defined the water energy use term, "Water energy use refers to the ratio of cold or ambient water to heated water use or the ratio of hot water to the total water use . . ." And the expert witness is not a POSITA like the named inventor and the patent examiner who reviewed and approved patent application. Furthermore, a POSITA would not view the arguments made by Joseph Paradiso as not meeting the clear and convincing standard for invalidity that *i4i* requires. For these reasons, Claim 42 in not indefinite under 35 U.S.C §112.

Paragraph 231 of Opening Expert Report

Joseph Paradiso incorrectly stated, ""the main water supply" has no antecedent basis. A POSA would not understand if this limitation refers back to the "water supply" or the "main water supply line, or whether the claim requires a separate "main water supply" in addition to the aforementioned "water supply" and "main water supply line."

RESPONSE - Here again and throughout the Opening Expert Report by Joseph Paradiso, the claims and specification of the Certificate of Correction were ignored; Joseph Paradiso's analyses and conclusions were made with regard to outdated claim language.

The current Claim 42 presented in the Certificate of Correction for the '837 Patent, reads as shown below:

> a base station having a water control valve mechanism interposed between a main water source and a water supply line for a building or a structure;
>
> b) one or more flow rate sensors connected to the water supply line and designed to monitor at least one or water use data, a water energy use data, a water quality data, or a leak detection information, or any combination thereof, from the building or the structure, the one or more flow rate sensors connected with the electrical circuitry;

Joseph Paradiso should have used the corrected specification paragraphs of the Certificate of Correction. Joseph Paradiso is not a POSITA like the named inventor and the patent examiner who reviewed and approved patent application. Furthermore, a POSITA would not view the arguments made by Joseph Paradiso as meeting the clear and convincing standard for invalidity that *i4i* requires. For these reasons, Claim 42 in not indefinite under 35 U.S.C §112.

Paragraph 232 of Opening Expert Report

Again Josehp Paradiso is incorrect in stating that ""the long - range LoRa, Sigfox, UNB, NB–IoT, 6LOWPAN, WiMAX, cellular technology 3GPP and LTE-M and 5G" in limitation f) differs from the previous recitation of "at least one of a LoRa, Sigfox, Ultra Narrow Band 6LowPAN, NB-IoT LTE-M cellular, and 5G cellular technology," in limitation d). A POSA would not understand if the scope of the claim covers certain technologies that are excluded from the first list but included in the second list, such as "cellular technology 3GPP" and "WiMAX," and the specification and prosecution history do not resolve this uncertainty.

RESPONSE - Here again and throughout the Opening Expert Report by Joseph Paradiso, the claims and specification of the Certificate of Correction were ignored; Joseph Paradiso's analyses and conclusions were made with regard to outdated claim language.

The current Claim 42 presented in the Certificate of Correction for the '837 Patent, reads as shown below:

d) one or more wireless communication technologies comprising at 1least one of a LoRa, a Sigfox, an U1tra Narrow Band (UNB), a 6LoWPAN, a WiMAX, a NB-loT, a 3GPP cellular, a 4G/LTE-M cellular, or a 5G cellular technology, or any comb nation thereof;

f) wherein the one or more wireless communication technologies comprising at least one of the LoRa, the Sigfox, the Ultra Narrow Band (UNB), the 6LoWPAN, the WiMAX, the NB-loT, the 3GPP cellular, the 4G/LTE-M cellular, or the 5G cellular technology, or any combination thereof, consists of a duplex technology to transmit the water use data, the water energy use data, the water quality data, or the leak detection information, or any combination thereof, and send commands to regulate the water control valve mechanism;

Joseph Paradiso should have used the corrected specification paragraphs of the Certificate of Correction. Joseph Paradiso is not a POSITA like the named inventor and the patent examiner who reviewed and approved patent application. Furthermore, a POSITA would not view the arguments made by Joseph Paradiso as meeting the clear and convincing standard for invalidity that *i4i* requires. For these reasons, Claim 42 in not indefinite under 35 U.S.C §112.

Paragraph 233 of Opening Expert Report

Joesph Paradiso once again, did not read or include the Certificate of Correction phrase by stating “the CPU, microprocessor or microcontroller can at least include one of a programming setting managed by the user, remotely a mode setting, and a default or restricted setting processed by the manufacturing factory to... ”Because the verb is phrased using optional language (“can ... include”), a POSA would not understand what (if anything) is required to satisfy this limitation.”

RESPONSE - Here again and throughout the Opening Expert Report by Joseph Paradiso, the claims and specification of the Certificate of Correction were ignored; Joseph Paradiso’s analyses and conclusions were made with regard to outdated claim language.

The current Claim 42 presented in the Certificate of Correction for the ‘837 Patent, reads as shown below:

the CPU, the microprocessor, or the microcontroller, or any combination thereof, includes at least one of a programming setting managed by a user to remotely set a mode setting or modify a default setting processed by a manufacturer to:

a) record a water flow event to an integrated memory bank or a removable memory device for analysis;

b) combine a plurality of water flow events into the integrated memory bank and subsequently schedule the transfer of the water flow events to a one or more remote computers or servers or to a cloud computing company;

c) transfer the water flow event to the one or more remote computers or servers or to the cloud computing company,

d) transfer the water data or information utilizing a blockchain technology to the one or more remote computers or servers or to the cloud computing company,

e) modify water units or timing units,

f) establish alarm set points; or any combination thereof;

Joseph Paradiso should have used the corrected specification paragraphs of the Certificate of Correction. Joseph Paradiso is not a POSITA like the named inventor and the patent examiner who reviewed and approved patent application, Furthermore, a POSITA would not view the arguments made by Joseph Paradiso as meeting the clear and convincing standard for invalidity that *i4i* requires. For these reasons, Claim 42 in not indefinite under 35 U.S.C §112.

Paragraph 234 of Opening Expert Report

Joesph Paradiso incorrectly concluded that, "claims ultimately depending therefrom are indefinite because "the user" has no antecedent basis, and a POSA would have no understanding as to which potential "user" this language might refer. For example, the user could be the installer of the equipment, an employee of a water utility, a customer of a water utility, or some other person, and each interpretation changes the scope of the claim."

RESPONSE - Here again and throughout the Opening Expert Report by Joseph Paradiso, the claims and specification of the Certificate of Correction were ignored; Joseph Paradiso's analyses and conclusions were made with regard to outdated claim language.

The current Claim 42 presented in the Certificate of Correction for the '837 Patent, reads as shown below:

the CPU, the microprocessor, or the microcontroller, or any combination thereof, includes at least one of a programming setting managed by a user to remotely set a mode setting or modify a default setting processed by a manufacturer to:

The specification of the '837 in Fig. 1 shows a user as – communicating water use . . . information to a governmental, civil, or municipal employee or individual 60 . . . (Exhibit E – (Municipal User Access with Cell Phone to 420RDM Water Meter)

> The remote server and database can be used to support a computer portal designated or registered users or owners . . . (Exhibit F - Mueller IoT Cell Phone communication with Home User Access)

Joseph Paradiso should have used the corrected specification paragraphs of the Certificate of Correction where this limitation has been corrected and is clearly understood by a POSITA. And the expert witness is not a POSITA like the named inventor and the patent examiner who reviewed and approved patent application. Furthermore, a POSITA would not view the arguments made by Joseph Paradiso as meeting the clear and convincing standard for invalidity that *i4i* requires. For these reasons, Claim 42 in not indefinite under 35 U.S.C §112.

Paragraph 235 of Opening Expert Report

Joseph Paradiso incorrectly stated, "Asserted Independent Claim 42 of the '837 Patent and claims ultimately depending therefrom are indefinite because "the manufacturing factory" has no antecedent basis."

RESPONSE - Here again and throughout the Opening Expert Report by Joseph Paradiso, the claims and specification of the Certificate of Correction were ignored; Joseph Paradiso's analyses and conclusions were made with regard to outdated claim language.

The current Claim 42 presented in the Certificate of Correction for the '837 Patent, reads as shown below:

the CPU, the microprocessor, or the microcontroller, or any combination thereof, includes at least one of a programming setting managed by a user to remotely set a mode setting or modify a default setting processed by a manufacturer to:

Joseph Paradiso should have used the corrected specification paragraphs of the Certificate of Correction. Joseph Paradiso is not a POSITA like the named inventor and the patent examiner who reviewed and approved patent application. Furthermore, a POSITA would not view the arguments made by Joseph Paradiso as meeting the clear and convincing standard for

invalidity that *i4i* requires. For these reasons, Claim 42 in not indefinite under 35 U.S.C §112.

Paragraph 236 of Opening Expert Report

Joseph Paradiso incorrectly stated, "Asserted Independent Claim 42 of the '837 Patent and claims ultimately depending therefrom are indefinite because a POSA would not understand what is meant by "regional or controlled analysis." The terms "regional or controlled analysis," "regional analysis," and "controlled analysis" do not appear in the specification."

RESPONSE - Here again and throughout the Opening Expert Report by Joseph Paradiso, the claims and specification of the Certificate of Correction were ignored; Joseph Paradiso's analyses and conclusions were made with regard to outdated claim language.

The current Claim 42 presented in the Certificate of Correction for the '837 Patent, reads as shown below:

a) record a water flow event to an integrated memory bank or a removable memory device for analysis;

Joseph Paradiso should have used the corrected specification paragraphs of the Certificate of Correction. Joseph Paradiso is not a POSITA like the named inventor and the patent examiner who reviewed and approved patent application. Furthermore, a POSITA would not view the arguments made by Joseph Paradiso as meeting the clear and convincing standard for invalidity that *i4i* requires. For these reasons, Claim 42 in not indefinite under 35 U.S.C §112.

Paragraph 237 of Opening Expert Report

Joseph Paradiso stated, "Asserted Independent Claim 42 of the '837 Patent and claims ultimately depending therefrom are indefinite because a POSA would not understand what is meant by "regional or controlled analysis." The terms "regional or controlled analysis," "regional analysis," and "controlled analysis" do not appear in the specification."

RESPONSE - Here again and throughout the Opening Expert Report by Joseph Paradiso, the claims and specification of the Certificate of Correction were ignored; Joseph Paradiso's analyses and conclusions were made with regard to outdated claim language.

In addition, the Certification of Correction states: "FIG. 11 shows an example of an application or page (APP) 300 for Water Use 302 having a daily 304 graph 306 with day hours 308, designated by the symbol AM 312 and the night hours 310 designated by the symbol PM 314. At the right side of the example application or page (APP) 300 is the daily total use of water 316 and the daily total cost in dollars (or other currency) 318 the weekly total use of water 326 and the weekly total cost in dollars 328, and the monthly total use of water 336 and the monthly total cost in dollars 338 by year 334 per regional water rates that has been downloaded the data 340 from the registered or serving water municipality. Within the daily graph 306 is a plotted Line 307 that shows the hourly water use. The plotted Line 307 can have a rolling feature whereby new data replaces the oldest data in the graph. A gallon or liter scale can be included on the left side of the daily graph 305 (not shown)." Furthermore, the expert witness, Joseph Paradiso should understand from the context of the specification, file history, and the claims that Claim 47 is definite. And the expert witness is not POSIAs like the named inventor and the patent examiner who reviewed and approved patent application. POSITAs would view the arguments by Joseph Paradiso as not meeting the clear and convincing standard for anticipation.

The current Claim 42 presented in the Certificate of Correction for the '837 Patent, reads as shown below:

a) record a water flow event to an integrated memory bank or a removable memory device for analysis;

Joseph Paradiso is not a POSITA like the named inventor and the patent examiner who reviewed and approved patent application. Furthermore, a POSITA would not view the arguments made by Joseph Paradiso as meeting the clear and convincing standard for

invalidity that *i4i* requires. For these reasons, Claim 42 in not indefinite under 35 U.S.C §112.

Paragraph 238 of Opening Expert Report

Joseph Paradiso stated, "Claim 42 indefinite because "the water flow event dataset" lacks antecedent basis, and a POSA would not understand if this limitation refers to "the water flow event" of limitation a), the "plurality of water low events" preceding recitation of "the water flow event dataset" in limitation b), or some other previously unintroduced "water flow event dataset." Each of these interpretations leads to a POSA to a different understanding of what is required to infringe the claim."

RESPONSE - Here again and throughout the Opening Expert Report by Joseph Paradiso, the claims and specification of the Certificate of Correction were ignored; Joseph Paradiso's analyses and conclusions were made with regard to outdated claim language.

The current Claim 42 presented in the Certificate of Correction for the '837 Patent, reads as shown below:

b) combine a plurality of water flow events into the integrated memory bank and subsequently schedule the transfer of the water flow events to a one or more remote computers or servers or to a cloud computing company;.

Joseph Paradiso, also intentionally or negligently, overlooked that the Saberi '241 Patent does not disclose or claim a water flow event as defined in the '837 specification and used in claim 42 and defined in 6:16-26 of the specification which defines: "Water flow event or water flow event basis is defined as monitoring and sensing the initiation of water flow until the water flow is stopped, whereby the water flow rate, the duration of water flow, and the total water volume can be calculated and recorded. The water flow event will inherently save CPU and wireless transmission energy by not recording or transmitting no water use data and allowing the CPU or microprocessor to go into a sleep mode between each water event use

thereby providing a superior method for analyzing water signatures and patterns for reliable discernment of leak and leak locations."

In U.S. Patent 10,410,501, which is a parent to the '837 CIP, and which is U.S. Pat. Pub. No. 2016/0163177 and Patent Application Ser. No. 15/016,178 filed on February 4, 2016, defines the water flow event at 5:65-67 to 6:14 as "Water Flow Event or Water Flow Event Basis refers to the period the water begins flowing and remains until the continuous flow of water terminates or ends , allowing observation and/or recording and/or transmission of data regarding the duration of the water use, the beginning, intermediate and ending flow rates, and the total volume of water used during the water flow event or water flow event basis."

Joseph Paradiso should have used the corrected claims of the Certificate of Correction. Joseph Paradiso is not a POSITA like the named inventor and the patent examiner who reviewed and approved patent application. Furthermore, a POSITA would not view the arguments made by Joseph Paradiso as meeting the clear and convincing standard for invalidity that *i4i* requires. For these reasons, Claim 42 in not indefinite under 35 U.S.C §112.

Paragraph 239 of Opening Expert Report

Joseph Paradiso stated, "indefinite because "the water .flow event" lacks antecedent basis, and a POSA would
not understand if this limitation refers to "the water flow event" of limitation a), the "plurality of water low events" of limitation b), "the water flow event dataset" in limitation b) (which is, itself, indefinite), or some other previously unintroduced "water .flow event." Each of these interpretations leads to a POSA to a different understanding of what is required to infringe the claim."

RESPONSE - Here again and throughout the Opening Expert Report by Joseph Paradiso, the claims and specification of the Certificate of Correction were ignored; Joseph Paradiso's analyses and conclusions were made with regard to outdated claim language.

The current Claim 42 presented in the Certificate of Correction for the '837 Patent, reads as shown below:

a) record a water flow event to an integrated memory bank or a removable memory device for analysis;

b) combine a plurality of water flow events into the integrated memory bank and subsequently schedule the transfer of the water flow events to a one or more remote computers or servers or to a cloud computing company;

Also, Joseph Paradiso should have used the corrected claims and the corrected specification of the Certificate of Correction. Joseph Paradiso is not a POSITA like the named inventor and the patent examiner who reviewed and approved patent application. Furthermore, a POSITA would not view the arguments made by Joseph Paradiso as meeting the clear and convincing standard for invalidity that *i4i* requires. For these reasons, Claim 42 in not indefinite under 35 U.S.C §112.

Paragraph 240 of Opening Expert Report

Joseph Paradiso incorrectly stated, "remote computer or server, or to a cloud service company" introduced by the limitation "b) combine a plurality of water low events into a local . . . remote computer or server, or to a cloud service company" are the same as or separate from the "remote computer or server, or to a cloud service company" introduced by the limitation "c) directly transfer the water .flow event to a remote computer or server, or to a cloud service company" or the "remote computer or server, or to a cloud service."

RESPONSE - Here again and throughout the Opening Expert Report by Joseph Paradiso, the claims and specification of the Certificate of Correction were ignored; Joseph Paradiso's analyses and conclusions were made with regard to outdated claim language.

The current Claim 42 presented in the Certificate of Correction for the '837 Patent, reads as shown below:

> b) combine a plurality of water flow events into the integrated memory bank and subsequently schedule the transfer of the water flow events to a one or more remote computers or servers or to a cloud computing company;
>
> c) transfer the water flow event to the one or more remote computers or servers or to the cloud computing company,
>
> d) transfer the water data or information utilizing a blockchain technology to the one or more remote computers or servers or to the cloud computing company,

Joseph Paradiso should have used the corrected claims and the corrected specification of the Certificate of Correction. And Joseph Paradiso is not a POSITA like the named inventor and the patent examiner who reviewed and approved patent application. Furthermore, a POSITA would not view the arguments made by Joseph Paradiso as meeting the clear and convincing standard for invalidity that *i4i* requires. For these reasons, Claim 42 in not indefinite under 35 U.S.C §112.

Paragraph 241 of Opening Expert Report

Joseph Paradiso is incorrect in stating that, ""indefinite because a POSA would not understand what is meant by "transfer the water flow data utilizing a blockchain format to one or more remote computers or servers, or cloud service company." As discussed above with respect to the Written Description Requirement, the specification does not reference "blockchain," let alone a "blockchain format." Accordingly, a POSA would not understand what is required to infringe the claim under limitation d)."

RESPONSE - Here again and throughout the Opening Expert Report by Joseph Paradiso, the claims and specification of the Certificate of Correction were ignored; Joseph Paradiso's analyses and conclusions were made with regard to outdated claim language.

Joseph Paradiso should have used the corrected specification paragraphs of the Certificate of Correction. In the Certificate of Correction now reads in Column 23, Lines 20-46 as follows:

In the water meter environment, non-repudiation refers to the technology that confirms or ensures and prevents a sender or receiver from denying that a message(s), control/command signal(s), data, and/or information was sent or received. Blockchain technology is an upcoming technology that will ensure non-repudiation compliance.

The current Claim 42 presented in the Certificate of Correction for the '837 Patent, reads as shown below:

d) transfer the water data or information utilizing a blockchain technology to the one or more remote computers or servers or to the cloud computing company;

Joseph Paradiso should have used the corrected claims and the corrected specification of the Certificate of Correction. Joseph Paradiso is not a POSITA like the named inventor and the patent examiner who reviewed and approved patent application. Furthermore, a POSITA would not view the arguments made by Joseph Paradiso as meeting the clear and convincing standard for invalidity that *i4i* requires. For these reasons, Claim 42 in not indefinite under 35 U.S.C §112.

Paragraph 242 of Opening Expert Report

Joseph Paradiso stated, "a POSA would not understand whether the "water use data, water energy use data, water quality data and leak detection information" introduced by the limitation "the one or more wireless communication technologies capable of transmitting at least one of a 1)" are the same as or separate from the "water use data, water energy use data, water quality data and leak detection information" introduced by the limitation "f) wherein the long - range LoRa, Sigfox, UNB, NB-IoT, 6LOWPAN, WiMAX, cellular technology 3GPP and LTE-M and 5G consist of a duplex technology to both receive at least one of water use data, water energy use data, water quality data and leak detection information.""

RESPONSE - Here again and throughout the Opening Expert Report by Joseph Paradiso, the claims and specification of the Certificate of Correction were ignored; Joseph Paradiso's analyses and conclusions were made with regard to outdated claim language.

The current Claim 42 presented in the Certificate of Correction for the '837 Patent, reads as shown below:

> d) one or more wireless communication technologies comprising at 1least one of a LoRa, a Sigfox, an U1tra Narrow Band (UNB), a 6LoWPAN, a WiMAX, a NB-loT, a 3GPP cellular, a 4G/LTE-M cellular, or a 5G cellular technology, or any comb nation thereof;
>
> f) wherein the one or more wireless communication technologies comprising at least one of the LoRa, the Sigfox, the Ultra Narrow Band (UNB), the 6LoWPAN, the WiMAX, the NB-loT, the 3GPP cellular, the 4G/LTE-M cellular, or the 5G cellular technology, or any combination thereof, consists of a duplex technology to transmit the water use data, the water energy use data, the water quality data, or the leak detection information, or any combination thereof, and send commands to regulate the water control valve mechanism;

Joseph Paradiso should have used the corrected claims and the corrected specification of the Certificate of Correction where this limitation has been corrected and is clearly understood by a POSITA. And the expert witness is not a POSITA like the named inventor and the patent examiner who reviewed and approved patent application. Furthermore, a POSITA would not view the arguments made by Joseph Paradiso as meeting the clear and convincing standard for invalidity that *i4i* requires. For these reasons, Claim 42 in not indefinite under 35 U.S.C §112.

Paragraph 243 of Opening Expert Report

Joseph Paradiso stated, "a POSA would not understand what is meant by "command the management of the water control valve." For example, the specification discusses the use an APP to manage the water control valve mechanism, but the specification does not discuss "command[ing] the management" of the water control valve. A POSA would not understand if

this limitation requires, *e.g.*, the water control valve to be commanded or the APP (*i.e.* the management of the water control valve) to be commanded, and these differing interpretations result in different understandings of what is required to infringe the claim."

RESPONSE - Here again and throughout the Opening Expert Report by Joseph Paradiso, the claims and specification of the Certificate of Correction were ignored; Joseph Paradiso's analyses and conclusions were made with regard to outdated claim language.

This is an absurd and nonsensical argument as the specification defines throughout and Fig. 12 clearly defines management of the water control valve. The expert witness Joseph Paradiso is not a POSITA like the named inventor and the patent examiner who reviewed and approved patent application. Furthermore, a POSITA would not view the arguments made by Joseph Paradiso as meeting the clear and convincing standard for invalidity that *i4i* requires. For this reason, Claim 42 in not indefinite under 35 U.S.C §112.

Paragraph 244 of Opening Expert Report

Joseph Paradiso incorrectly states that, "Claim 42 of the '837 Patent and claims ultimately depending therefrom are indefinite because "the water control valve" lacks antecedent basis.

RESPONSE - Here again and throughout the Opening Expert Report by Joseph Paradiso, the claims and specification of the Certificate of Correction were ignored; Joseph Paradiso's analyses and conclusions were made with regard to outdated claim language.

The current Claim 42 presented in the Certificate of Correction for the '837 Patent, reads as shown below:

a base station having a water control valve mechanism interposed between a main water source and a water supply line lor a building or a structure;

f) wherein the one or more wireless communication technologies comprising at least one of the LoRa, the Sigfox, the Ultra Narrow Band (UNB), the 6LoWPAN, the WiMAX, the NB-loT, the 3GPP cellular, the 4G/LTE-M cellular, or the 5G cellular technology, or any combination thereof, consists of a duplex technology to transmit the water use data, the water energy use data, the water quality data, or the leak detection information, or any combination thereof, and send commands to regulate the water control valve mechanism;

The first occurrence of the water control valve mechanism is preceded with the singular "a" and the second occurrence of the water control valve mechanism is preceded with antecedent basis "the".

Joseph Paradiso should have used the corrected claims and the corrected specification of the Certificate of Correction where this limitation has been corrected and is clearly understood by a POSITA. And the expert witness Joseph Paradiso is not POSITA like the named inventor and the patent examiner who reviewed and approved patent application. Furthermore, a POSITA would not view the arguments made by Joseph Paradiso as meeting the clear and convincing standard for invalidity that *i4i* requires. For these reasons, Claim 42 in not indefinite under 35 U.S.C §112.

Paragraph 245 of Opening Expert Report

Joseph Paradiso stated, "a POSA would not understand what is meant by at least one of an Internet connection, a private network system, and a corporate owned network system, and a smart phone, computer, server, tablet, web portal, and other electronic communication device."

RESPONSE - Here again and throughout the Opening Expert Report by Joseph Paradiso, the claims and specification of the Certificate of Correction were ignored; Joseph Paradiso's analyses and conclusions were made with regard to outdated claim language.

The current Claim 42 presented in the Certificate of Correction for the '837 Patent, reads as shown below:

the one or more wireless communication technologies configured to:

(i) transmit at least one of the water use data, the water energy use data, the water quality data, or the leak detection information, or any combination thereof, to the one or more remote computers or servers or to the cloud computing company; and

(ii) receive an instruction or signal to command the management of the water control valve mechanism or perform another command operation;

using at least one of an Internet connection, a private network system, or a corporate owned network system that communicates with a smart phone, a computer, a server, a tablet, a web portal, or another electronic communication device.

This is a nonsensical argument, and the expert witness, Joseph Paradiso, is not a POSITA like the named inventor and the patent examiner who reviewed and approved patent application. Furthermore, a POSITA would not view the arguments made by Joseph Paradiso as meeting the clear and convincing standard for invalidity that *i4i* requires. For this reason, Claim 42 in not indefinite under 35 U.S.C §112.

Paragraph 246 of Opening Expert Report

Joseph Paradiso incorrectly stated, "POSA would not understand what is meant by "the one or more wireless communication technologies capable of transmitting at least one of a 1) water use data water energy use data, water quality data and leak detection information and, 2) obtains an instruction or signal to command the management of the water control valve or perform a command operation, using at least one of an Internet connection, a private network system, and a corporate owned network system, and a smart phone, computer, server, tablet, web portal, and other electronic communication device, that communicates with at least one of a remote computer or server, a commercial cloud-company, and a web-based company."

RESPONSE - Here again and throughout the Opening Expert Report by Joseph Paradiso, the claims and specification of the Certificate of Correction were ignored; Joseph Paradiso's analyses and conclusions were made with regard to outdated claim language.

The current Claim 42 presented in the Certificate of Correction for the '837 Patent, reads as shown below:

the one or more wireless communication technologies configured to:

(i) transmit at least one of the water use data, the water energy use data, the water quality data, or the leak detection information, or any combination thereof, to the one or more remote computers or servers or to the cloud computing company; and

(ii) receive an instruction or signal to command the management of the water control valve mechanism or perform another command operation;

Joseph Paradiso should have used the corrected claims and the corrected specification of the Certificate of Correction where this limitation has been corrected and is clearly understood by a POSITA. And the expert witness Joseph Paradiso is not a POSITA like the named inventor and the patent examiner who reviewed and approved patent application. Furthermore, a POSITA would not view the arguments made by Joseph Paradiso as meeting the clear and convincing standard for invalidity that *i4i* requires. For these reasons, Claim 42 in not indefinite under 35 U.S.C §112.

B. CLAIM 47 IS INVALID AS INDEFINITE UNDER 35 U.S.C. § 112.

Paragraph 247 of Opening Expert Report

Joesph Paradiso stated, "the "smart phone, computer, server, tablet, web portal and one or more other electronic communication devices" recited in Asserted Dependent Claim 47 are the same as or separate from the "smart phone, computer, server, tablet, web portal and one or more other electronic communication device(s)" recited in Asserted Independent Claim 42."

RESPONSE - Here again and throughout the Opening Expert Report by Joseph Paradiso, the claims and specification of the Certificate of Correction were ignored; Joseph Paradiso's analyses and conclusions were made with regard to outdated claim language.

The current Claim 42 presented in the Certificate of Correction for the '837 Patent, reads as shown below:

> using at least one of an Internet connection, a private network system, or a corporate owned network system that communicates with a smart phone, a computer, a server, a tablet, a web portal, or another electronic communication device.

The current Claim 47 presented in the Certificate of Correction for the '837 Patent, reads as shown below:

> 47. A water meter and leak detection system as recited in claim 42, wherein an owner or the user communicates with at least one of the smart phone, the computer, the server, the tablet, the web portal, or the other electronic communication device that includes a software program displaying an icon, a menu, or a sub menu that provides at least one function of:

Joseph Paradiso should have used the corrected claims and the corrected specification of the Certificate of Correction where this limitation has been corrected and is clearly understood by a POSITA. POSITA would understand from the context of the specification, file history, and the claims that Claim 47 is adequately definite. The expert witness, Joseph Paradiso, is not a POSITA like the named inventor and the patent examiner who reviewed and approved Rein Tech's patent application. Furthermore, a POSITA would not view the arguments made by Joseph Paradiso as meeting the clear and convincing standard for invalidity that *i4i* requires. For these reasons, Claim 47 in not indefinite under 35 U.S.C §112.

Paragraph 248 of Opening Expert Report

Joesph Paradiso has incorrectly stated, "a POSA whether the "user" is the same as or separate from "the user" recited in Asserted Independent Claim 42, and as discussed above, it would be further unclear to a POSA who is considered the "user" of the claimed system."

RESPONSE - Here again and throughout the Opening Expert Report by Joseph Paradiso, the claims and specification of the Certificate of Correction were ignored; Joseph Paradiso's analyses and conclusions were made with regard to outdated claim language.

The current Claim 42 presented in the Certificate of Correction for the '837 Patent, reads as shown below:

the CPU, the microprocessor, or the microcontroller, or any combination thereof, includes at least one of a programming setting managed by a user to remotely set a mode setting or modify a default setting processed by a manufacturer to:

47. A water meter and leak detection system as recited in claim 42, wherein an owner or the user communicates with at least one of the smart phone, the computer, the server, the tablet, the web portal, or the other electronic communication device that includes a software program displaying an icon, a menu, or a sub menu that provides at least one function of:

In the Certificate of Correction, the antecedent basis is properly defined, and the term "user" is clearly the same.

Joseph Paradiso should have used the corrected claims and the corrected specification of the Certificate of Correction where this limitation has been corrected and is clearly understood by a POSITA. POSITA would understand from the context of the specification, file history, and the claims that Claim 47 is adequately definite. Joseph Paradiso is not a POSITA like the named inventor and the patent examiner who reviewed and approved Rein Tech's patent application. Furthermore, a POSITA would not view the arguments made by Joseph Paradiso as meeting the clear and convincing standard for invalidity that *i4i* requires. For these reasons, Claim 47 in not indefinite under 35 U.S.C §112.

Paragraph 249 of Opening Expert Report

Joseph Paradiso stated that a POSA would not understand what is meant by "software program application . . . at least one function of." and concludes this is grammatically incorrect.

RESPONSE - Here again and throughout the Opening Expert Report by Joseph Paradiso, the claims and specification of the Certificate of Correction were ignored; Joseph Paradiso's analyses and conclusions were made with regard to outdated claim language.

The current Claim 42 presenting a software program and displaying an icon, menu or other is clearly defined in the Certificate of Correction for the '837 Patent, reads as shown below.

> A water meter and leak detection system as recited in claim 42, wherein an owner or the user communicates with at least one of the smart phone, the computer, the server, the tablet, the web portal, or the other electronic communication device that includes a software program displaying an icon, a menu, or a sub menu that provides at least one function of:

Joseph Paradiso should have used the corrected claims and the corrected specification of the Certificate of Correction where this limitation has been corrected and is clearly understood by a POSITA. A POSITA would understand from the context of the specification, file history, and the claims that Claim 47 is adequately definite. The expert witness, Joseph Paradiso, is not POSITA like the named inventor and the patent examiner who reviewed and approved Rein Tech's patent application. Furthermore, a POSITA would not view the arguments made by Joseph Paradiso as meeting the clear and convincing standard for invalidity that *i4i* requires. For these reasons, Claim 47 in not indefinite under 35 U.S.C §112.

Paragraph 250 of Opening Expert Report

Joseph Paradiso incorrectly stated that a POSA would not understand what is meant by "water energy usage history," as similarly discussed above with respect to "water energy use data."

RESPONSE - Here again and throughout the Opening Expert Report by Joseph Paradiso, the claims and specification of the Certificate of Correction were ignored; Joseph Paradiso's analyses and conclusions were made with regard to outdated claim language.

It is USPTO policy that the Inventor can be a lexicographer for terms used in the specification. If the expert witness, Joseph Paradiso had read the specification as closely as has for challenging the validity of the '837 patent, he should not have missed paragraph [0045] of the Klicpera U.S. Patent Publication No.2016/0163177, the Parent of the '837 Patent, which defined the water energy use term, "Water energy use refers to the ratio of cold or ambient water to heated water use or the ratio of hot water to the total water use . . ." And the expert witness is not a POSITAs like the named inventor and the patent examiner who reviewed and approved patent application. Furthermore, the expert witness has not met the clear and convincing standard for invalidity that *i4i* requires. For these reasons, Claim 42 in not indefinite under 35 U.S.C §112.

Joseph Paradiso should have used the corrected claims and the corrected specification of the Certificate of Correction. A POSITA would understand from the context of the specification, file history, and the claims that Claim 47 is adequately definite. The expert witness, Joseph Paradiso, is not a POSITA like the named inventor and the patent examiner who reviewed and approved Rein Tech's patent application. Furthermore, a POSITA would not view the arguments made by Joseph Paradiso as meeting the clear and convincing standard for invalidity that *i4i* requires. For these reasons, Claim 47 in not indefinite under 35 U.S.C §112.

Paragraph 251 of Opening Expert Report

Joseph Paradiso stated, "Claim 47 of the '837 Patent and claims ultimately depending therefrom are indefinite because "said remote central computer" lacks antecedent basis. A POSA would not understand if this limitation introduces a new element required for infringement."

RESPONSE - Here again and throughout the Opening Expert Report by Joseph Paradiso, the claims and specification of the Certificate of Correction were ignored; Joseph Paradiso's analyses and conclusions were made with regard to outdated claim language.

The current Claim 47 presented in the Certificate of Correction for the '837 Patent, reads as shown below:

> (a) providing a graphical display of at least one of the water use data, the water energy use data, or the water quality data, or any combination thereof, from a selected water fixture or a water appliance, the water data or in-formation transferred from at least one of the base station, a remote central computer, or the cloud computing company,

Joseph Paradiso should have used the corrected claims and the corrected specification of the Certificate of Correction. A POSITA would understand from the context of the specification, file history, and the claims that Claim 47 is adequately definite. Joseph Paradiso, is not a POSITA like the named inventor and the patent examiner who reviewed and approved Rein Tech's patent application. Furthermore, a POSITA would not view the arguments made by Joseph Paradiso as meeting the clear and convincing standard for invalidity that *i4i* requires. For these reasons, Claim 47 in not indefinite under 35 U.S.C §112.

Paragraph 252 of Opening Expert Report

Joseph Paradiso stated that "the cloud service provider" lacks antecedent basis. A POSA would not understand if this limitation introduces a new element required for infringement or if it incorrectly refers back to one or more of the various recitations of "cloud service company".

RESPONSE - Here again and throughout the Opening Expert Report by Joseph Paradiso, the claims and specification of the Certificate of Correction were ignored; Joseph Paradiso's analyses and conclusions were made with regard to outdated claim language.

Joseph Paradiso should have used the corrected claims and the corrected specification of the Certificate of Correction. A POSITA would understand from the context of the specification, file history, and the Certificate of Correction claims that Claim 47 is adequately definite. Joseph Paradiso is not a POSITA like the named inventor and the patent examiner who reviewed and approved Rein Tech's patent application. Furthermore, a POSITA would not view the arguments made by Joseph Paradiso as meeting the clear and convincing standard for invalidity that *i4i* requires. For these reasons, Claim 47 in not indefinite under 35 U.S.C §112.

Paragraph 253 of Opening Expert Report

Joesph Paradiso incorrectly stated, "indefinite because a POSA would not understand what is meant by "at least one of said base station, said remote central computer and the cloud service provider or web-based computer"

RESPONSE - Here again and throughout the Opening Expert Report by Joseph Paradiso, the claims and specification of the Certificate of Correction were ignored; Joseph Paradiso's analyses and conclusions were made with regard to outdated claim language.

The current Claim 47 presented in the Certificate of Correction for the '837 Patent, reads as shown below:

> (a) providing a graphical display of at least one of the water use data, the water energy use data, or the water quality data, or any combination thereof, from a selected water fixture or a water appliance, the water data or information transferred from at least one of the base station, a remote central computer, or the cloud computing company;

POSITAs would understand from the context of the specification, file history, and the Certificate of Correction claims that Claim 47 is adequately definite. Joseph Paradiso is not a POSITA like the named inventor and the patent examiner who reviewed and approved Rein Tech's patent application. Furthermore, a POSITA would not view the arguments made by

Joseph Paradiso as meeting the clear and convincing standard for invalidity that *i4i* requires. For these reasons, Claim 47 in not indefinite under 35 U.S.C §112.

Paragraph 254 of Opening Expert Report

Joesph Paradiso incorrectly stated, ""sending a command signal transferred to the base station." For example, a POSA would not understand if this limitation requires a "command signal" to be "sen[t]" that was previously "transferred to the base station," or whether the limitation requires a "command signal" to be "sen[t]" and then subsequently "transferred to the base station." Further, it is unclear where the "command signal" is required to be "sen[t]" and what structure is required to "send[]" the "command signal." Each of these interpretations results in different requirements to infringe the claim. Further, a POSA would not understand how the signal is "transferred to the base station," nor which components are responsible for "transferring" the "command signal" "to the base station."

RESPONSE - Here again and throughout the Opening Expert Report by Joseph Paradiso, the claims and specification of the Certificate of Correction were ignored; Joseph Paradiso's analyses and conclusions were made with regard to outdated claim language.

The current Claim 47 presented in the Certificate of Correction for the '837 Patent, reads as shown below:

(a) turning on or off a water supply by sending a command signal to the base station;

Joseph Paradiso should have used the corrected specification paragraphs of the Certificate of Correction where this limitation has been corrected and is clearly understood by a POSITA. A POSITA would understand from the context of the specification, file history, and the Certificate of Correction claims that Claim 47 is adequately definite. The expert witness, Joseph Paradiso, is not a POSITA like the named inventor and the patent examiner who reviewed and approved Rein Tech's patent application. Furthermore, a POSITA would not view the arguments made by Joseph Paradiso as meeting the clear and convincing standard

for invalidity that *i4i* requires. For these reasons, Claim 47 in not indefinite under 35 U.S.C §112.

Paragraph 255 of Opening Expert Report

Joseph Paradiso incorrectly stated, "Claim 47 of the '837 Patent and claims ultimately depending therefrom are indefinite because "the water control valve mechanism position" lacks antecedent basis. Even if a POSA were to assume this limitation referred to the "position" of a "water control valve mechanism,""

RESPONSE - Here again and throughout the Opening Expert Report by Joseph Paradiso, the claims and specification of the Certificate of Correction were ignored; Joseph Paradiso's analyses and conclusions were made with regard to outdated claim language.

The current Claim 47 presented in the Certificate of Correction for the '837 Patent, reads as shown below:

A. identifying an operational position of the water control valve mechanism by sending a request to the base station;

Joseph Paradiso should have used the corrected specification paragraphs of the Certificate of Correction where this limitation has been corrected and is clearly understood by a POSITA. A POSITA would understand from the context of the specification, file history, and the Certificate of Correction claims that Claim 47 is adequately definite. The expert witness, Joseph Paradiso, is not a POSITA like the named inventor and the patent examiner who reviewed and approved Rein Tech's patent application. Furthermore, a POSITA would not view the arguments made by Joseph Paradiso as meeting the clear and convincing standard for invalidity that *i4i* requires. For these reasons, Claim 47 in not indefinite under 35 U.S.C §112.

Paragraph 256 of Opening Expert Report

Joseph Paradiso incorrectly stated, "Claim 47 of the '837 Patent and claims ultimately depending therefrom are indefinite because it is unclear whether "modifying a program" refers to the "software program application" or a separate program."

RESPONSE - Here again and throughout the Opening Expert Report by Joseph Paradiso, the claims and specification of the Certificate of Correction were ignored; Joseph Paradiso's analyses and conclusions were made with regard to outdated claim language.

The current Claim 49 presented in the Certificate of Correction for the '837 Patent, reads as shown below:

(a) showing or modifying the software program, a setting, or a default menu included within the base station

POSITAs would understand from the context of the specification, file history, and the Certificate of Correction claims that Claim 47 is adequately definite. The expert witness Joseph Paradiso is not a POSITA like the named inventor and the patent examiner who reviewed and approved Rein Tech's patent application. Furthermore, a POSITA would not view the arguments made by Joseph Paradiso as meeting the clear and convincing standard for invalidity that *i4i* requires. For these reasons, Claim 47 in not indefinite under 35 U.S.C §112.

Paragraph 257 of Opening Expert Report

Joseph Paradiso incorrectly stated, "a POSA would not understand what is meant by "incorporated within the base station." The list preceding this limitation refers to various software elements that lack physical form; therefore, a POSA would not understand how these formless constructs can be "incorporated within the base station.""

RESPONSE - Here again and throughout the Opening Expert Report by Joseph Paradiso, the claims and specification of the Certificate of Correction were ignored; Joseph Paradiso's analyses and conclusions were made with regard to outdated claim language.

The current Claim 47 presented in the Certificate of Correction for the '837 Patent, reads as shown below:

(d) showing or modifying the software program, a setting, or a default menu included within the base station.

This is a preposterous and absurd analysis, conclusion and statement by the expert witness Mr. Joseph Paradiso. POSITAs would understand from the context of the specification, file history, and the Certificate of Correction claims that Claim 47 is adequately definite. The expert witness, Joseph Paradiso, is not a POSITA like the named inventor and the patent examiner who reviewed and approved Rein Tech's patent application. Furthermore, a POSITA would not view the arguments made by Joseph Paradiso as meeting the clear and convincing standard for invalidity that *i4i* requires. For these reasons, Claim 47 in not indefinite under 35 U.S.C §112.

Paragraph 258 of Opening Expert Report

Joseph Paradiso incorrectly stated, "indefinite because a POSA would not understand how "the water control valve mechanism position" can be "specif[ied]" by "sending a request to the base station.""

RESPONSE: Here again and throughout the Opening Expert Report by Joseph Paradiso, the claims and specification of the Certificate of Correction were ignored; Joseph Paradiso's analyses and conclusions were made with regard to outdated claim language.

This is a preposterous and absurd analysis, conclusion and statement by the expert witness Mr. Joseph Paradiso. The Certificate of Correction has made these limitations or elements to be clearer as shown below.

(e) identifying an operational position of the water control valve mechanism by sending a request to the base station;

POSITAs would understand from the context of the specification, file history, and the Certificate of Correction claims that Claim 47 is adequately definite. The expert witness, Joseph Paradiso, is not a POSITA like the named inventor and the patent examiner who reviewed and approved Rein Tech's patent application. Furthermore, a POSITA would not view the arguments made by Joseph Paradiso as meeting the clear and convincing standard for invalidity that *i4i* requires. For these reasons, Claim 47 in not indefinite under 35 U.S.C §112.

C. CLAIM 48 IS INVALID AS INDEFINITE UNDER 35 U.S.C. § 112.

Paragraph 259 of Opening Expert Report

Joseph Paradiso incorrectly stated, "Claim 48 of the '837 Patent and claims ultimately depending therefrom are indefinite because it is unclear what is meant by "one of collection nodes."

RESPONSE - Here again and throughout the Opening Expert Report by Joseph Paradiso, the claims and specification of the Certificate of Correction were ignored; Joseph Paradiso's analyses and conclusions were made with regard to outdated claim language.

The current Claim 48 presented in the Certificate of Correction for the '837 Patent, reads as shown below:

48. A water meter and leak detection system as recited in claim 45, wherein the base station includes at least one of a mesh or a peer-to-peer technology circuitry that communicates with a one or more base stations or the one or more communication hubs.

Joseph Paradiso should have used the corrected claims and the corrected specification of the Certificate of Correction where this limitation has been corrected and is clearly understood by a POSITA. And the expert witness, Joseph Paradiso, is not a POSITA like the named

inventor and the patent examiner who reviewed and approved patent application. Furthermore, a POSITA would not view the arguments made by Joseph Paradiso as meeting the clear and convincing standard for invalidity that *i4i* requires. For these reasons, Claim 48 in not indefinite under 35 U.S.C §112.

Paragraph 260 of Opening Expert Report

Joseph Paradiso incorrectly stated, "Claim 48 of the '837 Patent and claims ultimately depending therefrom are indefinite because "one of collection nodes" lacks antecedent basis, and a POSA would not understand what "collection nodes" refers to and how these structures relate to the remainder of the claim limitations."

RESPONSE - Here again and throughout the Opening Expert Report by Joseph Paradiso, the claims and specification of the Certificate of Correction were ignored; Joseph Paradiso's analyses and conclusions were made with regard to outdated claim language.

The current Claim 48 presented in the Certificate of Correction for the '837 Patent, reads as shown below:

> 48. A water meter and leak detection system as recited in claim 45, wherein the base station includes at least one of a mesh or a peer-to-peer technology circuitry that communicates with a one or more base stations or the one or more communication hubs.

Joseph Paradiso should have used the corrected claims and the corrected specification of the Certificate of Correction where this limitation has been corrected and is clearly understood by a POSITA. And the expert witness, Joseph Paradiso, is not a POSITA like the named inventor and the patent examiner who reviewed and approved patent application. Furthermore, a POSITA would not view the arguments made by Joseph Paradiso as meeting the clear and convincing standard for invalidity that *i4i* requires. For these reasons, Claim 42 in not indefinite under 35 U.S.C §112.

Paragraph 261 of Opening Expert Report

Joseph Paradiso incorrectly stated, "Claim 48 of the '837 Patent and claims ultimately depending therefrom are indefinite because a POSA would not understand what is meant by "are capable of including at least one of a mesh and/or and peer-to-peer technology circuitry." First, this limitation is phrased to claim a capability, and a POSA would not understand how this claimed capability limits the scope of the claim. Second, because of the string of conjunctions included in the limitation, a POSA would not understand if the claim requires the inclusion of at least one of *both* the mesh and peer-to-peer technology circuitry or if it only requires, at minimum, at least one mesh *or* at least one peer-to-peer technology circuitry."

RESPONSE - Here again and throughout the Opening Expert Report by Joseph Paradiso, the claims and specification of the Certificate of Correction were ignored; Joseph Paradiso's analyses and conclusions were made with regard to outdated claim language.

The Certificate of Correction has been modified to make these limitations or elements to be clearer as shown below which deleted at least one of a mesh or a peer-to-peer technology circuitry. The expert witness, Joseph Paradiso, should have used the corrected claims and the corrected specification of the Certificate of Correction where this limitation has been corrected and is clearly understood by a POSITA. And the expert witness, Joseph Paradiso, is not a POSITA like the named inventor and the patent examiner who reviewed and approved patent application. Furthermore, a POSITA would not view the arguments made by Joseph Paradiso as meeting the clear and convincing standard for invalidity that *i4i* requires. For these reasons, Claim 42 in not indefinite under 35 U.S.C §112.

Paragraph 262 of Opening Expert Report

Joseph Paradiso incorrectly stated, "Claim 48 of the '837 Patent and claims ultimately depending therefrom are indefinite because a POSA would not understand what is modified by the limitation " . . . that can communicate with at least one of another water meter collection nodes and communications hubs." A POSA would not understand if this language modifies "one of collection nodes," "a mesh," or "peer-to-peer technology circuitry.""

RESPONSE - Here again and throughout the Opening Expert Report by Joseph Paradiso, the claims and specification of the Certificate of Correction were ignored; Joseph Paradiso's analyses and conclusions were made with regard to outdated claim language.

The current Claim 48 presented in the Certificate of Correction for the '837 Patent, reads as shown below:

> 48. A water meter and leak detection system as recited in claim 45, wherein the base station includes at least one of a mesh or a peer-to-peer technology circuitry that communicates with a one or more base stations or the one or more communication hubs.

Joseph Paradiso should have used the corrected claims and the corrected specification of the Certificate of Correction where this limitation has been corrected and is clearly understood by a POSITA. And the expert witness, Joseph Paradiso, is not a POSITA like the named inventor and the patent examiner who reviewed and approved patent application. Furthermore, a POSITA would not view the arguments made by Joseph Paradiso as meeting the clear and convincing standard for invalidity that *i4i* requires. For these reasons, Claim 42 in not indefinite under 35 U.S.C §112.

Paragraph 263 of Opening Expert Report

Joseph Paradiso incorrectly stated, "POSA would not understand what is meant by "at least one of another water meter collection nodes and communication hubs." "Water meter collection nodes" and "communication hubs" both lack antecedent basis, and no "water meter collection node" has been previously introduced to explain "another water meter collection node." To the extent this limitation refers back to "one of collection nodes," that term also lacks antecedent basis. In fact, not a single structure recited within Claim 48 refers back to any structure introduced in Independent Claim 42; therefore, a POSA would have no understanding of how Claim 48 further limits Independent Claim 42."

RESPONSE - Here again and throughout the Opening Expert Report by Joseph Paradiso, the claims and specification of the Certificate of Correction were ignored; Joseph Paradiso's analyses and conclusions were made with regard to outdated claim language.

The current Claim 48 presented in the Certificate of Correction for the '837 Patent, reads as shown below:

> 48. A water meter and leak detection system as recited in claim 45, wherein the base station includes at least one of a mesh or a peer-to-peer technology circuitry that communicates with a one or more base stations or the one or more communication hubs.

Joseph Paradiso should have used the corrected claims and the corrected specification of the Certificate of Correction where this limitation has been corrected and is clearly understood by a POSITA. And the expert witness is not a POSITA like the named inventor and the patent examiner who reviewed and approved patent application. Furthermore, a POSITA would not view the arguments made by Joseph Paradiso as meeting the clear and convincing standard for invalidity that *i4i* requires. For these reasons, Claim 48 in not indefinite under 35 U.S.C §112.

## D. CLAIM 49 IS INVALID AS INDEFINITE UNDER 35 U.S.C. § 112.

Paragraph 264 of Opening Expert Report

Joseph Paradiso incorrectly stated, "POSA would not understand what is meant by "one of more communication hubs." This term lacks antecedent basis and does not clearly refer to any structure previously introduced by Independent Claim 42."

RESPONSE - Here again and throughout the Opening Expert Report by Joseph Paradiso, the claims and specification of the Certificate of Correction were ignored; Joseph Paradiso's analyses and conclusions were made with regard to outdated claim language.

The current Claim 49 presented in the Certificate of Correction for the '837 Patent, reads as shown below:

> 49. A water meter and leak detection system as recited in claim 45, wherein the one or more communication hubs includes at least one of a mesh or a peer-to-peer technology circuitry that communicates with a one or more base stations.

Joseph Paradiso should have used the corrected claims and the corrected specification of the Certificate of Correction where this limitation has been corrected and is clearly understood by a POSITA. And the expert witness is not a POSITA like the named inventor and the patent examiner who reviewed and approved patent application, Furthermore, a POSITA would not view the arguments made by Joseph Paradiso as meeting the clear and convincing standard for invalidity that *i4i* requires. For these reasons, Claim 49 in not indefinite under 35 U.S.C §112.

Paragraph 265 of Opening Expert Report

Joseph Paradiso incorrectly stated, "Claim 49 of the '837 Patent and claims ultimately depending therefrom are indefinite because a POSA would not understand what is meant by "are capable of including at least one of a mesh and/or and peer-to-peer technology circuitry." First, this limitation is phrased to claim a capability, and a POSA would not understand how this claimed capability limits the scope of the claim. Second, because of the string of conjunctions included in the limitation, a POSA would not understand if the claim requires the inclusion of at least one of *both* the mesh and peer-to-peer technology circuitry or if it only requires, at minimum, at least one mesh *or* at least one peer-to-peer technology circuitry."

RESPONSE - Here again and throughout the Opening Expert Report by Joseph Paradiso, the claims and specification of the Certificate of Correction were ignored; Joseph Paradiso's analyses and conclusions were made with regard to outdated claim language.

The current Claim 49 presented in the Certificate of Correction for the '837 Patent, reads as shown below:

49. A water meter and leak detection system as recited in claim 45, wherein the one or more communication hubs includes at least one of a mesh or a peer-to-peer technology circuitry that communicates with a one or more base stations.

Joseph Paradiso should have used the corrected claims of the Certificate of Correction where this limitation has been corrected and is clearly understood by a POSITA. And the expert witness Joseph Paradiso is not a POSITA like the named inventor and the patent examiner who reviewed and approved patent application. Furthermore, a POSITA would not view the arguments made by Joseph Paradiso as meeting the clear and convincing standard for invalidity that *i4i* requires. For these reasons, Claim 49 in not indefinite under 35 U.S.C §112.

Paragraph 266 of Opening Expert Report

Joseph Paradiso incorrectly stated, "Claim 49 of the '837 Patent and claims ultimately depending therefrom are indefinite because a POSA would not understand what is meant by "at least one of another water meter collection nodes and communication hubs." "Water meter collection nodes" and "communication hubs" both lack antecedent basis, and no "water meter collection node" has been previously introduced to explain "another water meter collection node." In fact, not a single structure recited within Claim 49 refers back to any structure introduced in Independent Claim 42 therefore, a POSA would have no understanding of how Claim 49 further limits Independent Claim 42."

RESPONSE - Here again and throughout the Opening Expert Report by Joseph Paradiso, the claims and specification of the Certificate of Correction were ignored; Joseph Paradiso's analyses and conclusions were made with regard to outdated claim language.

The current Claim 49 presented in the Certificate of Correction for the '837 Patent, reads as shown below:

> 49. A water meter and leak detection system as recited in claim 45, wherein the one or more communication hubs includes at least one of a mesh or a peer-to-peer technology circuitry that communicates with a one or more base stations.

Joseph Paradiso should have used the corrected claims of the Certificate of Correction where this limitation has been corrected and is clearly understood by a POSITA. And the expert witness is not a POSITA like the named inventor and the patent examiner who reviewed and approved patent application. Furthermore, a POSITA would not view the arguments made by Joseph Paradiso as meeting the clear and convincing standard for invalidity that *i4i* requires. For these reasons, Claim 49 in not indefinite under 35 U.S.C §112.

Paragraph 267 of Opening Expert Report

Joseph Paradiso incorrectly stated, "Claim 49 of the '837 Patent and claims ultimately depending therefrom are indefinite because a POSA would not understand what is modified by the limitation of "...that can communicate with at least one of another water meter collection nodes and communications hubs." Specifically, a POSA would not understand if this refers to "one of more communication hubs," or "a mesh," or "peer-to-peer technology circuitry."

RESPONSE - Here again and throughout the Opening Expert Report by Joseph Paradiso, the claims and specification of the Certificate of Correction were ignored; Joseph Paradiso's analyses and conclusions were made with regard to outdated claim language.

The current Claim 49 presented in the Certificate of Correction for the '837 Patent, reads as shown below:

> 49. A water meter and leak detection system as recited in claim 45, wherein the one or more communication hubs includes at least one of a mesh or a peer-to-peer technology circuitry that communicates with a one or more base stations.

Joseph Paradiso should have used the corrected claims of the Certificate of Correction where this limitation has been corrected and is clearly understood by a POSITA. And the expert witness is not a POSITA like the named inventor and the patent examiner who reviewed and approved patent application. Furthermore, a POSITA would not view the arguments made by Joseph Paradiso as meeting the clear and convincing standard for invalidity that *i4i* requires. For these reasons, Claim 49 in not indefinite under 35 U.S.C §112.

**Michael E. Klicpera**
**March 17, 2025**

**/s/*Michael E. Klicpera***

**JACK SHRUM, P.A.**

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Dated: March 18, 2025

# EXHIBIT L

**IN THE UNITED STATES DISTRICT COURT**

**FOR THE DISTRICT OF DELAWARE**

| | |
|---|---|
| **REIN TECH, INC.**<br><br>**Plaintiff,**<br><br>**v.**<br><br>**MUELLER SYSTEMS, LLC**<br><br>**Defendant.** | **C.A. No. 1:18-cv-01683-MN** |

**RESPONSE TO REBUTTAL BY PARADISO TO KLICPERA'S EXPERT WITNESS REPORT**

# RESPONSE TO REBUTTAL BY PARADISO TO KLICPERA'S EXPERT WITNESS REPORT

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**A. INTRODUCTION**

**Rein Tech continues to assert the claims of the '837 Patent. The '837 Certificate of Correction is valid as reviewed and approved by USPTO. All corrections met the Certificate of Correction statutory requirements of 35 U.S.C. 255. There are no new claims.**

**1) CERTIFICATE OF CORRECTION RULES AND POLICY**

**The Certificate of Correction for the 11,549,837 Patent ('837 Patent) was reviewed and processed by the USPTO Examiner and Supervisor and approved by the Director of the USPTO on October 15, 2023. The claim elements and limitations presented in this Certificate of Correction are the valid '837 Patent claims as recognized by the USPTO. Per 35 U.S. Code § 255, "Certificate of correction of applicant's mistake states that "such patent, together with the certificate, shall have the same effect and operation in law on the trial of actions for causes thereafter arising as if the same had been originally issued in such corrected form".**

**Per USPTO MPEP 1481:**

**Applicant errors can also be corrected, but only if the error was made in good faith. and**

***In re Arnott,* 19 USPQ2d 1049, 1052 (Comm'r Pat. 1991) specifies the criteria of 35 U.S.C. 255 (for a certificate of correction) as follows:**

**Two separate statutory requirements must be met before a Certificate of Correction for an applicant's mistake may issue. The first statutory requirement concerns the**

**nature, i.e., type, of the mistake for which a correction is sought. The mistake must be:**

**(1) of a clerical nature,**

**(2) of a typographical nature, or**

**(3) a mistake of minor character.**

**The second statutory requirement concerns the nature of the proposed correction. The correction must not involve changes which would:**

**(1) constitute new matter or**

**(2) require reexamination.**

**All corrections in the '837 Certificate of Corrections met the criteria of MPEP 1481. No corrections involved changes that constituted new matter or broadened the scope of the '837 claims.**

**Per MPEP Section 1485 Handling of Request for Certificates of Correction [R-01.2024]:**

**UNITED STATES PATENT AND TRADEMARK OFFICE CERTIFICATE OF CORRECTION**

**Patent No.: 99,999,999**

**Application No.: 99/999,999**

**Issue Date: May 1, 2002**

**Inventor(s): Eli Y. Rosenthal**

**It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:**

**Column 10, line 29, cancel the text beginning with "12. A sensor device" to and ending "active strips." in column 11, line 10, and insert the following claim:**

**12. A control circuit of the character set forth in claim 4 and for an automobile having a convertible top, and including; means for moving the top between a raised and lowered retracted position; and control means responsive to a sensor relay for energizing the top moving means for moving said top from a retracted position to a raised position.**

**The MPEP 1485 example, directly above, substantiates changes (including deleting "active strips" and ending with "raised position," and moving and changing the term "sensor device" to "sensor relay" in amended claim (12). This example affirms that staying within the intended invention with support by the specification and without adding new matter is considered a mistake of minor character per USPTO Certificate of Correction policy.**

**Mueller's expert, Paradiso wrote his opening and rebuttal expert reports with complete knowledge of the '837 Certificate of Correction. Defendant Mueller was fully aware of the '837 Certificate of Correction before it was approved on October 15, 2024. Defendant accepted multiple Court stays specifically to allow time for the Certificate of Correction to be prosecuted and approved. Beyond the public availability of the Certificate of Correction, a copy of the initial version was provided with Klicpera's first expert witness report, and subsequently Rein Tech's updated '837 Claim Chart sent to Mueller included the Certificate of Correction language. Paradiso, chose to ignore the '837 Certificate of Correction claim language, and that error and wasted time is his responsibility and that of the Defendant.**

**All corrections in the '837 Certificate of Corrections met the criteria of 35 U.S.C. 255, and the Certificate of Corrections was reviewed and approved by USPTO. No new matter was introduced and no broadening of the scope of the claims was made by the Certificate of Correction.**

**2) EAGLE IRON WORKS V. MCLANAHAN CORPORATION**

**In Eagle Iron Works v. Mclanahan Corporation, the Court concluded that the patent together with the certificate of correction has the same effect and operation in law on the trial of actions for causes thereafter arising as if the same had been originally issued in such corrected form.**

**"Whenever a mistake of a clerical or typographical nature, or of a minor character, which was not the fault of the Patent Office, appears in a patent and a showing has been made that such mistake occurred in good faith, the Commissioner may issue a certificate of correction, if the correction does not involve such changes in the patent as would constitute new matter or would require re-examination. Such patent, together with the certificate, shall have the same effect and operation in law on the trial of actions for causes thereafter arising as if the same had been originally issued in such corrected form." *Eagle Iron Works v McLanahan Corporation*, 429 F.2d 137, U.S.P.Q. (BNA) 225.**

**"Both the Patent Office and the District Judge agreed with Eagle that the deletion of the word "first" in Claims 1 and 3 was a minor correction which only clarified the obviously intended simultaneous operation of the invention. That the Patent Office was aware of the alternative theory offered by McLanahan is apparent from McLanahan's attempt to block the issuance of the Certificate by its letter contesting Eagle's application for the Certificate." *id*.**

**"Since it is our conclusion that the District Judge correctly held that the Certificate of Correction did not change the scope of the patent and that it was validly issued pursuant to the statute, McLanahan's contention that it achieved intervening rights and its charge of bad faith on Eagle's part in dealing with the Patent Office in connection with its application for the Certificate of Correction must fall." *id.***

**3) MICROSOFT V. I4I LIMITED PARTNERSHIP**

**In Microsoft v. I4I Limited Partnership, the Court held that clear and convincing standard is required to challenge the validity of a Patent and Certification of Correction.**

**A POSITA would use the valid claim language defined in the Certificate of Correction and would understand from the context of the specification, file history, the prosecution history and concluded that claims that Claims 42, 45, and 47-49 of the '837 Patent, are adequately valid. A POSITA would view the arguments made by Paradiso as not meeting the clear and convincing standard that Microsoft Corp. v. i4i Limited Partnership, 564 U.S. 91 (2010) requires.**

**Paradiso apparently does not understand important USPTO policies and rules applicable to Certificates for Correction. The conclusion by Paradiso that the '837 Certificate of Correction is invalid disregards the USPTO process, review, and decision making. Paradiso infers that the USPTO Examiner, Supervisor and Director have all made errors in applying the USPTO rules and policies in granting the '837 Certificate of Correction. Furthermore, Paradiso, who is not as experienced as USPTO examiners and officials, should not be allowed to disregard the '837 Certificate of Correction. The USPTO professionals had the experience and details of the specification and file and prosecution history in finding that the claims that Claims 42, 45, 47-49 as shown in the Certificate of**

**Correction are valid. Paradiso baseless assumptions and faulty analysis of the claims of the '837 Patent question his role as a qualified or dependable expert witness. Both in his original and rebuttal expert reports, Paradiso continues to disregard the '837 Certificate of Corrections, and he's certainly not qualified to refute the decisions of the trained and qualified Patent Examiner and Supervisor, and approval by the Director of the USPTO.**

## B. REBUTTAL TO MUELLER'S DEFINITION OF ACCUSED PRODUCTS

Mr. Paradiso's Opinion:

***24.*** *In its Final Infringement Contentions dated May 12, 2023, Rein Tech identifies the Mueller products accused of infringing the '837 Patent as (1) the "Mueller 420RDM (Remote Disconnect Meter) with Cellular Node Meter Interface with MiNet®" ("the Cellular Combination") and (2) the "Mueller 420RDM (Remote Disconnect Meter) with Mi.Net® LoRaWAN (LW) Meter Interface Unit (Node)" ("the LoRaWAN Combination") (collectively, The "Accused Products").*

***25.*** *I understand that the 420RDM is one of a variety of water meters that Mueller Systems offers. I also understand that LoRaWAN is one of several wireless protocols that are used by some of the nodes that Mueller Systems offers. I also understand that the Cellular Node and the LoRa Node are two of a variety of nodes that Mueller Systems offers or has offered for sale.*

**Response:**

**The Accused Products include products fabricated and sold and continuing services by Defendant Mueller that practice the claims of the '837 Patent claims. These products include the cellular node 400 series water meter with control valve, LoRa node 400 series water meter with control valve, solid state (water) meter (SSM) with control valve, Mi.Node Owl, Mi.Node AC Repeater, Mi.Node DC Repeater, corporate network, Network**

**Operations Center (remote computers), and Amazon Web Services and associated database (remote computers).**

**The Accused Products that include the Mi.Net (corporate network), Mi.Node, Network Operations Center (remote computers), and Amazon Web Services and associated database (remote computers) are continuing services that facilitate operation of Mueller's water meters over time and transfer water data to the remote computers and cloud computing company.**

**The following '837 claim language supports Mueller's ongoing infringement of the '837 Patent beyond installation (underlining added):**

**Claim 1, "using at least one of an Internet connection, a private network system, or a corporate owned network system that communicates with a smart phone, a computer, a server, a tablet, a web portal, or another electronic communication device;"**

**Claim 45, "A water meter and leak detection system as recited in claim 42, further comprising one or more communication hubs in wired communication with the base station or having a wireless communication technology corresponding with the one or more wireless communication technologies of the base station, wherein the one or more communication hubs transfers the water use data, the water energy use data, the water quality data, or the leak detection information, or any combination thereof, <u>to at least one of the Internet connection, the private network system, or the corporate owned network system that communicates with company the one or more remote computers or servers or with the cloud computing company</u>;"**

**Claim 47, "A water meter and leak detection system as recited in claim 42, wherein an owner or the user communicates with at least one of the smart phone, the computer, the server, the tablet, the web portal, or the other electronic communication device that**

**includes a software program displaying an icon, a menu, or a submenu that provides at least one function of: a) providing a graphical display of at least one of the water use data, the water energy use data, or the water quality data, or any combination thereof, from a selected water fixture or a water appliance, the water data or information transferred from at least one of the base station, a remote central computer, or the cloud computing company; b) displaying an alarm condition based on one of the water use data, the water energy use data, or the water quality data, or any combination thereof, and programmed into the base station; (c) turning on or off a water supply by sending a command signal to the base station; (d) showing or modifying the software program, a setting, or a default menu included within the base station; (e) identifying an operational position of the water control valve mechanism by sending a request to f) downloading updates or regional water rates into the base station; or(g) programming a vacation or work water schedule into the base station."**

**Claim 48, "A water meter and leak detection system as recited in claim 45, wherein the base station includes at least one of a mesh or a peer-to-peer technology circuitry that communicates with a one or more base stations or the one or more communication hubs."**

**Claim 49, "A water meter and leak detection system as recited in claim 45, wherein the one or more communication hubs includes at least one of a mesh or a peer-to-peer technology circuitry that communicates with a one or more base stations."**

Mr. Paradiso's Opinion:

*28. Rein Tech is asserting that the Accused Products infringe claims 42, 47, 48 and 49.*

**Response:**

**Rein Tech's Claim Chart incorporates the '837 Certificate of Correction. Rein Tech continues to assert that the Accused Products infringe 'Claims 42, 45, 47, 48, and 49 of the '837 Patent.**

## C. THE CELLULAR COMBINATION DOES INFRINGE THE ASSERTED CLAIMS

**As a Preface**, Paradiso ignored the claim language of the '837 Patent, which are shown in the valid '837 Certificate of Correction (CofC). In his report, Paradiso chose to disregard the CofC claim language. To address Paradiso's opinions, the '837 claim language is presented below within this rebuttal as follows:

- ~~The claim language as presented by Paradiso is shown with strike-out~~
- **The '837 Certificate of Correction claim language is shown in bold**

### 1) CLAIM 42

Mr. Paradiso's Opinion:

***31.*** *As demonstrated in detail below, the Cellular Combination does not include each of the limitations of independent claim 42.*

***32.*** *It is my opinion that the Cellular Combination does not directly infringe the claim because the accused Cellular Combination includes only the "Mueller 420RDM (Remote Disconnect Meter) with Cellular Node Meter Interface with MiNet®, but not any structure or feature corresponding to the "water line" or the "water supply," which are both affirmative elements of the claim. In other words, the water shut-off valve of the Cellular Combination is not "interposed between a main water supply line and a water supply for a building or structure" when the Cellular Combination is made, sold, offered for sale, or imported by Mueller. Such can occur (if at all) only after installation of the Accused Product. Rein Tech's contentions focus only*

*on the structure of the Cellular Combination and do not provide any indication or cite any evidence that Mueller is responsible for installing the Cellular Combination nor using the completed system.*"

**Response:**

**Paradiso continues to ignore the Certificate of Correction using the pre-CofC claim language which is presented with strikeout applied. The CofC claim is presented in bold.**

~~*a base station having a water control mechanism interposed between a main water supply line and a water supply for a building or structure*~~

**a base station having a water control valve mechanism interposed between a main water source and a water supply line for a building or a structure;**

**Plaintiff provided evidence that Mueller is responsible for installing the Cellular Combination (refer to Exhibit A, which contains exhibit pages from Klicpera's Expert Witness Report). Plaintiff's Research Attorney discovered the agreement for Mueller water meter installations in Newport Beach, CA beginning in 2023. This exhibit was previously provided to Paradiso but he apparently ignored it. This exhibited Purchase, Installation and Maintenance Amended Agreement, dated the 25th of May 2023 (after the '837 Patent issue date), was signed by Mueller Systems, LLC Vice President/General Manager Eric Stacey and Assistant Secretary Chason Carroll. This Agreement states that Mueller System, LLC would be paid eight million, one hundred and fifty thousand dollars ("8,150,000.00"). Contractor Mueller would be required for all Work performed in accordance with this Agreement including all reimbursable items, subcontractor fees, for the base contract amount. Hence, while Mueller states that they did not install the infringing water meters, they were paid for such and were responsible for the plumbing**

**installers or contractors and work. Mueller most likely installed their network system and developed the software for the Sentryx API for communicating with Amazon Web Services ("AWS"). Defendant Mueller maintains water data databases at the AWS and network operation center in Atlanta and likely elsewhere (web portal). Defendant Mueller Attorneys completely failed to disclose the Newport Beach water district and the $8,150,000 contract. It can be assumed that Mueller would use the same procedure, i.e., Purchase, Installation and Maintenance Agreement, with other sites that Mueller had not disclosed, including Calaveras County, California; Santa Rosa County, Florida; Dayton Beach, Florida; West Slope, Oregon, and any other nondisclosed sites.**

**Furthermore, Defendant Mueller provides instructions on how to install their water meters and how to connect to the cellular or LoRa network. (see Exhibits B and C)**

**Mueller's Installed Water Meter**

Mr. Paradiso's Opinion:

*33. Rein Tech's contentions do not establish that the limitation of "at least one of a CPU, microprocessor, and microcontroller" is met. Rein Tech identifies the "coated electronic board" of a LoRaWan Node as the alleged "electrical circuitry" but fails to identify any component corresponding to "a CPU, microprocessor and microcontroller with a power source." Specifically, for the proposition that the Cellular Combination includes an electrical circuitry, Rein Tech's contentions cite to the "coated electronic board" allegedly shown in Exhibit*

*(RT009366) and Exhibit (RT009368), which are each related to the LoRa Node, not the Cellular Node. Therefore, Rein Tech has provided no indication that the Cellular Node includes the required "electrical circuitry.***"**

**Response:**

**Paradiso continues to ignore the Certificate of Correction using the pre-CofC claim language which is presented with strikeout applied. The CofC claim is presented in bold.**

~~said base station further comprising; a) electrical circuitry including at least one of a CPU, microprocessor and microcontroller with a power source;~~

**an electrical circuitry including at least one of a CPU, a microprocessor, or a microcontroller, or any combination thereof;**

**Paradiso ignores that Mueller attorneys, during the discovery period, did not provide responsible or reasonable responses to the Rein Tech interrogatories (See Exhibit D), and did not provide production of documents or actual products as requested. These deficiencies were presented in the Klicpera's Expert Witness Report. Conversely, the Rein Tech sent Mueller's attorneys Rein Tech team emails, engineering drawings, pages from discovery documents, file histories, and two base stations (water meters) with communication hubs from its residential field study.**

**Mueller's Cellular Node, mounted on its water meter, has electrical communication with the water meter electrical circuitry to transfer water data using cellular wireless technology. The Plaintiff had to make an assumption regarding the "coated electronic board" from the perspective of a POSITA.**

Mr. Paradiso's Opinion:

*34. Additionally, Rein Tech's contentions allege only that "one skilled in the art would understand that a CPU, microprocessor with software instructions would be necessary to provide the functions of the water meter, such as organizing the recording and transmitting of water data to a remote source, remotely turning the water control valve on and off, etc;" however, this allegation provides no indication as to precisely what component(s) of the Cellular Combination are alleged to constitute the CPU, microprocessor or microcontroller, particularly in light of the fact that the Rein Tech contentions only rely upon evidence pertaining to the LoRaWAN node for these limitations.*

**Response:**

**Paradiso ignores that Mueller attorneys, during the discovery period, did not provide responsible or reasonable responses to the Rein Tech interrogatories (See Exhibit D), and did not provide production of documents or actual products as requested. These deficiencies were presented in the Klicpera's Expert Witness Report. Conversely, the Rein Tech sent Mueller's attorneys Rein Tech team emails, engineering drawings, pages from discovery documents, file histories, and two base stations (water meters) with communication hubs from its residential field study.**

**Mueller's Cellular Node, mounted on its water meter, has electrical communication with the water meter electrical circuitry to transfer water data using cellular wireless technology. One skilled in the art would certainly understand that a CPU, microprocessor with software instructions would be necessary to provide the functions of the water meter, such as organizing the recording and transmitting of water data to a remote source, or remotely turning the water control valve on and off. The Plaintiff had to make an assumption regarding the "coated electronic board" from the perspective of a POSITA.**

Mr. Paradiso's Opinion:

*35. Accordingly, a POSA would not understand Rein Tech's contentions to demonstrate that the Cellular Combination includes the limitations of said base station further comprising; a) electrical circuitry including at least one of a CPU, microprocessor and microcontroller with a power source.*

**Response:**

**Paradiso continues to ignore the Certificate of Correction using the pre-CofC claim language which is presented with strikeout applied. The CofC claim is presented in bold.**

~~said base station further comprising; a) electrical circuitry including at least one of a CPU, microprocessor and microcontroller with a power source~~.

**an electrical circuitry including at least one of a CPU, a microprocessor, or a microcontroller, or any combination thereof;**

**Paradiso ignores that Mueller attorneys, during the discovery period, did not provide responsible or reasonable responses to the Rein Tech interrogatories (See Exhibit D), and did not provide production of documents or actual products as requested. These deficiencies were presented in the Klicpera's Expert Witness Report. Conversely, the Rein Tech sent Mueller's attorneys Rein Tech team emails, engineering drawings, pages from discovery documents, file histories, and two base stations (water meters) with communication hubs from its residential field study.**

**Mueller's Cellular Node, mounted on its water meter, has electrical communication with the water meter electrical circuitry to transfer water data using cellular wireless technology. One skilled in the art would certainly understand that a CPU, microprocessor with software instructions would be necessary to provide the functions of the water meter, such as organizing the recording and transmitting of water data to a remote source, or**

**remotely turning the water control valve on and off. The Plaintiff had to make an assumption regarding the "coated electronic board" from the perspective of a POSITA.**

Mr. Paradiso's Opinion:

*36. In my opinion, the Cellular Combination does not include this limitation for several reasons.*

*37. First, the Cellular Combination does not include "one or more flow rate sensors." According to the Court's Claim Construction Order (D.I. 151), the limitation of "flow rate sensor" in independent claim 42 is construed as "[a] device that measures the rate of a flow of water." (D.I. 151, p. 1). Unlike many meters, such as ultrasonic meters, that directly measure the flow rate of water, the nutating disc sensor identified by Rein Tech in its contentions measures the total flow (or volume) of water, not the rate of flow of water. I understand that the nutating disk meter is a positive displacement meter, where each revolution of the internal measuring element denotes a certain volume of water that has passed through the meter. I have been informed that revolutions of the disk are counted by the register via a mechanical magnetic coupling or an electrical pickup. The nutating disk meter does not measure flow rate (volume/time); therefore, a POSA would not understand the Cellular Combination to include this limitation.*

**Response:**

**Paradiso continues to ignore the Certificate of Correction using the pre-CofC claim language which is presented with strikeout applied. The CofC claim is presented in bold.**

~~one or more flow rate sensor connected to the main water supply and connected to said electrical circuitry and designed to monitor at least one of a water use data, water energy use data, water quality data and leak detection information from said building or structure, said one or more flow rate sensors connected to the main water supply and connected with said electrical circuitry;~~

**one or more flow rate sensors connected to the water supply line and designed to monitor at least one of a water use data, a water energy use data, a water quality data, or a leak detection information, or any combination thereof, from the building or the structure, the one or more flow rate sensors connected with the electrical circuitry;**

**A POSITA would consider that a nutating disc includes a meter register that measures water flow over a period of time and, thus, the nutating disc is a flow rate sensor. Nutating disc flow meters are one of the most common types of positive displacement flow meters. They operate by having a disc mounted to a central ball. Water enters a precision machined chamber containing a disc that nutates (wobbles). The position of the disc divides the chamber into compartments containing an exact volume. Liquid pressure drives the disc to wobble and a roller cam causes the nutating disc to make a complete cycle. The movements of the disc are transmitted to an indicator/totalizer or pulse transmitter. When fluid enters the chamber, it causes the disc to wobble (nutate), transferring the displaced volume to the register. So, as an example, if the total volume data is recorded and transmitted every 15 minutes, then large and slow flows of water can be shown and compared every 15 minutes to determine if a leak occurs at a location, monitoring water use over time. If the nutating disc was not measuring water use over time, then what function does the nutating disc have?**

**Even if the Defendant were successful in claiming the nutating disc is not a flow rate sensor, then the defendant is still infringing under the Doctrine of Equivalents per MPEP 2186 Relationship to the Doctrine of Equivalents [R-07.2022]. The Doctrine of Equivalents arises in the context of an infringement action. If an accused product or process does not**

**literally infringe a patented invention, the accused product or process may be found to infringe under the Doctrine of Equivalents. The essential objective inquiry is: "Does the accused product or process contain elements identical or equivalent to each claimed element of the patented invention?"** ***Warner-Jenkinson Co. v. Hilton Davis Chemical Co.,*** **520 U.S. 17, 40, 41 USPQ2d 1865, 1875 (1997). In determining equivalence, "[a]n analysis of the role played by each element in the context of the specific patent claim will thus inform the inquiry as to whether a substitute element matches the function, way, and result of the claimed element, or whether the substitute plays a role substantially different from the claimed element." 520 U.S. at 40, 41 USPQ2d at 1875. Both a flow rate sensor and a nutating disc measure water consumption over time at a residence or corporation.**

Mr. Paradiso's Opinion:

*38. Second, this limitation requires "one or more . . . sensors connected to the main water supply." As similarly discussed above in Subsection VII.i.a.1. the nutating disc identified as the alleged flow rate sensor of the Cellular Combination is not connected to a main water supply when the Accused Product is made, sold, offered for sale, or imported by Mueller. Such can occur (if at all) only after installation and during use of the Accused Product by a customer. Rein Tech's contentions do not provide any indication or cite any evidence that Mueller is responsible for installing the Cellular Combination nor using the completed system after installation.*

**Response:**

**Plaintiff provided evidence that Mueller is responsible for installing the Cellular Combination (refer to Exhibit A, which contains exhibit pages from Klicpera's Expert Report). Plaintiff's Research Attorney discovered the agreement for Mueller water meter installations in Newport Beach, CA beginning in 2023. This exhibit was previously provided**

**to Paradiso but he apparently ignored it. This exhibited Purchase, Installation and Maintenance Amended Agreement, dated the 25th of May 2023 (after the '837 Patent issue date), was signed by Mueller Systems, LLC Vice President/General Manager Eric Stacey and Assistant Secretary Chason Carroll. This Agreement states that Mueller System, LLC would be paid eight million, one hundred and fifty thousand dollars ("8,150,000.00"). Contractor Mueller would be required for all Work performed in accordance with this Agreement including all reimbursable items, subcontractor fees, for the base contract amount. Hence, while Mueller states that they did not install the infringing water meters, they were paid for such and were responsible for the plumbing installers or contractors and work. Mueller most likely installed their network system and developed the software for the Sentryx API for communicating with Amazon Web Services ("AWS"). Defendant Mueller maintains water data databases at the AWS and network operation center in Atlanta and likely elsewhere (web portal). Defendant Mueller Attorneys completely failed to disclose the Newport Beach water district and the $8,150,000 contract. It can be assumed that Mueller would use the same procedure, i.e., Purchase, Installation and Maintenance Agreement, with other sites that Mueller had not disclosed, including Calaveras County, California; Santa Rosa County, Florida; Dayton Beach, Florida; West Slope, Oregon, and any other nondisclosed sites.**

**Furthermore, Defendant Mueller provides instructions on how to install their water meters and how to connect to the cellular or LoRa network. (See Exhibits B and C)**

**Mueller's Installed Water Meter**

Mr. Paradiso's Opinion:

*39. Third, this limitation requires the "one or more . . . sensors . . . [to be] connected to said electrical circuitry." As, similarly discussed above in Subsection VII.i.a.2., Rein Tech has not identified electrical circuitry within the Cellular Combination. Additionally, as I understand from my conversations with Mueller Systems employees, the nutating disc sensor identified by Rein Tech in its contentions is not electrically connected to the "coated electronic board" identified b[y] Rein Tech as corresponding to the "electrical circuitry" limitation, nor any other electrical structure. Instead, the nutating disc sensor is coupled magnetically to electronics within the register.*[4]

**Response:**

**Paradiso ignores that Mueller attorneys, during the discovery period, did not provide responsible or reasonable responses to the Rein Tech interrogatories (See Exhibit D), and did not provide production of documents or actual products as requested. These deficiencies were presented in the Klicpera's Expert Witness Report. Conversely, the Rein Tech sent Mueller's attorneys Rein Tech team emails, engineering drawings, pages from discovery documents, file histories, and two base stations (water meters) with communication hubs from its residential field study.**

**Paradiso stated that "the nutating disc sensor is coupled magnetically to electronics within the register." However, the Mueller representative informed Rein Tech that Mueller has two registers, the Mueller Encoder Eight (ME-8) and the Solid State Register (SSR) registers. Attached in Exhibit E and F are copies of Mueller's publications for the ME-8 register and the SSR register, respectively. The ME-8 provides 8 digits of electronic resolution that is interrogated by a Mueller Systems AMR/AMI device, the Mueller Encoder ME-8 register communicates the unique ten-digit serial number and up to an eight-digit electronic reading in ACSII format where it can be recorded and maintained within the reporting structure of the AMR/AMI system. The SSR register provides up to 10 digits of visual resolution and up to 9 digits of electronic resolution for "outstanding" granularity when used in conjunction with Mueller Systems AMR and AMI systems. Granularity of data and frictionless operation permit customers to capture maximum revenue and be proactive in leak detection and resource conservation. (underlining added)**

**Even if the Defendant were successful in claiming their nutating disc sensor is coupled magnetically to electronics within the ME-8 and SSR registers, then the defendant is still infringing under the Doctrine of Equivalents per MPEP 2186 Relationship to the Doctrine of Equivalents [R-07.2022]. The Doctrine of Equivalents arises in the context of an infringement action. If an accused product or process does not literally infringe a patented invention, the accused product or process may be found to infringe under the Doctrine of Equivalents. The essential objective inquiry is: "Does the accused product or process contain elements identical or equivalent to each claimed element of the patented invention?" *Warner-Jenkinson Co. v. Hilton Davis Chemical Co.,* 520 U.S. 17, 40, 41 USPQ2d 1865, 1875 (1997). In determining equivalence, "[a]n analysis of the role played by each element in the context of the specific patent claim will thus inform the inquiry as to**

**whether a substitute element matches the function, way, and result of the claimed element, or whether the substitute plays a role substantially different from the claimed element." 520 U.S. at 40, 41 USPQ2d at 1875. Even if Mueller's nutating disc sensor is coupled magnetically to electronics within the ME-8 and SSR registers, both a flow rate sensor and a nutating disc measure water consumption over time at a residence or corporation. Also, both Mueller's ME-8 and SSR communicate with the cellular node and LoRa node and, therefore, a CPU, microprocessor or microcontroller communicates to operate the pilot control valve and coordinates of the wireless transmissions.**

Mr. Paradiso's Opinion:

*40. This limitation is not met for the reasons discussed above in Subsection VII.i.a.2. For example, Rein Tech's contentions fail to identify "electrical circuitry" in the Cellular Combination; therefore, Rein Tech's contentions fail to demonstrate that the Cellular Combination meets the limitation that "said power source is electrically connected to said electrical circuitry."*

**Response:**

**Paradiso continues to ignore the Certificate of Correction using the pre-CofC claim language which is presented with strikeout applied. The CofC claim is presented in bold.**

~~said power source that is at least one of an AC powered, DC powered, and one or more standard or rechargeable batteries, said rechargeable batteries capable of being supplemented with a turbine or other rotational mechanism that generates electrical energy said power source is electrically connected to said electrical circuitry;~~

**a power source that is at least one or an AC powered, a DC powered, or a one or more standard or rechargeable batteries, or any combination thereof, the**

**rechargeable batteries capable of being supplemented with a turbine or other rotational mechanism that generates electrical energy, the power source is electrically connected to the electrical circuitry**;

**Paradiso ignores that Mueller attorneys, during the discovery period, did not provide responsible or reasonable responses to the Rein Tech interrogatories (See Exhibit D), and did not provide production of documents or actual products as requested. These deficiencies were presented in the Klicpera's Expert Witness Report. Conversely, the Rein Tech sent Mueller's attorneys Rein Tech team emails, engineering drawings, pages from discovery documents, file histories, and two base stations (water meters) with communication hubs from its residential field study.**

**From the position of a POSITA, the water meter would not be able to close the water control valve mechanism. conduct wireless transfer of water data, etc. if there was no power source. The electrical circuitry would be dead if there was no power source. A POSITA understands that electrical circuitry requires a power source to function.**

Mr. Paradiso's Opinion:

*41. Mueller does not directly infringe Claim 42 because the wireless communication technology of the Cellular Combination does not "utilize[] authentication and encryption technologies" when the Cellular Combination is made, sold, offered for sale or imported by Mueller. Such can occur (if at all) only after installation and during use of the Accused Product by a customer. Rein Tech's contentions do not provide any indication or cite any evidence that Mueller is responsible for installing the Cellular Combination nor using the completed system after installation.*

**Response:**

**Paradiso continues to ignore the Certificate of Correction using the pre-CofC claim language which is presented with strikeout applied. The CofC claim is presented in bold.**

~~wherein said one or more wireless communication technologies utilizes authentication and encryption technologies for pairing operations and to prevent unauthorized access to the water data or information; and~~

**wherein the one or more wireless communication technologies utilizes authentication and encryption technologies for pairing operations and to prevent unauthorized access to a water data or information; and**

**The '837 Claim Chart provided to the Defendant incorporates the Certificate of Correction claim language. Mueller's water meters utilize authentication and encryption technologies for pairing operations and to prevent unauthorized access to the water data or information. Per Mueller, "Security, LoRaWAN employs two layers of strict security measures. With network security, it ensures authenticity of the node in the network, while the application layer of the security ensures the network operator does not have access to the end user's application data" (Exhibit 2, page 3 in Klicpera's Expert Witness Report) and "Security LoRaWAN by design is very secure – authentication and encryption are, in fact, mandatory" (Exhibit 3, page 1 in Klicpera's Expert Witness Report). Also per Mueller, "With two session keys, the Network Session Key (NwkSKey) and Application key (APPSKey) to prevent spoofing and eavesdropping" (Exhibit 17 at Bates No. MUE00000069-MUE000000072 and Exhibit 19 at Bates No. MUE000000078 in Klicpera's Expert Witness Report).**

**Encryption and Authentication is critical and implied by the security of the water meter and wireless transmissions. Mueller has implemented security measures to provide data protection on the user interface, critical field devices, and utility IT data systems. Amazon Web Service (AWS) provides an added level of protection of the utility, homeowner and business data. If a command signal is sent by the operations center that a leak has been detected as a particular residence, some form an authentication is necessary that the command signal only turns off the desired water meter. (Exhibit 2, page 3 in Klicpera's Expert Witness Report).**

**The '837 Claim Chart provided to the Defendant incorporates the Certificate of Correction claim language. Per Mueller, "Security, LoRaWAN employs two layers of strict security measures. With network security, it ensures authenticity of the node in the network, while the application layer of the security ensures the network operator does not have access to the end user's application data" (Exhibit 3, page 1 in Klicpera's Expert Witness Report) and "Security LoRaWAN by design is very secure – authentication and encryption are, in fact, mandatory. With two session keys, the Network Session Key (NwkSKey) and Application key (APPSKey) to prevent spoofing and eavesdropping" (Exhibit 17 at Bates No. MUE00000069-MUE000000 in Klicpera's Expert Witness Report).**

**Furthermore, shown in Exhibit G is the mobileRDM (a phone app and device) that shows the signal strength, presets, battery voltage, and firmware version of a particular water meter that has been paired and authenticated.**

**Exhibits G and J display a mobileRDM that demonstrates a cell phone with a Meuller water APP to remotely connect or disconnect water services using a two-way radio. While a user or a corporate car is within 1000 feet a service connection, selecting a function on the Mueller water APP a signal is transferred to the Mueller water meter. The water**

**meter 25-30 second process (pairing the mobileRDM) confirms that the user signal has been sent. Once connected with the mobileRDM application, water service can be connected or disconnected. The mobileRDM application confirms to the user when the process is complete. One of the phone settings is the Reset (or Preset) button.**

**The '837 Claim Chart provided to the Defendant incorporates the Certificate of Correction claim language. Mueller, states "Why Mueller Cellular Node?" and "Enhanced Security: Mueller has implemented security measures to provide data protection on the user interface, critical field devices, and utility IT data systems. Amazon Web Service (AWS) provides an added level of protection of the utility, homeowner and business data." (Exhibit 9 in Klicpera's Expert Witness Report)**

**A POSITA would understand the information discussed above and would conclude that authentication and encryption are utilized by the Mueller water meter with cellular node.**

Mr. Paradiso's Opinion:

*42. Additionally, Rein Tech's contentions fail to establish that the wireless communication technology of the Cellular Combination is capable of "utilize[ing] authentication and encryption technologies." Rein Tech's contentions rely solely on Mi.Mesh (which is not used with Cellular Nodes) and "security measures" that purportedly "provide data protection on the user interface, critical field devices, and utility IT data systems [and] Amazon Web Service (AWS)[, which] provides an added level of protection of the utility, homeowner and business data." A POSA would understand that this does not relate to the wireless communication technology of the 420 RDM with Cellular Node, nor whether this technology utilizes authentication and encryption*

*technologies. Accordingly, Rein Tech's contentions fail to demonstrate that this limitation is met by the Cellular Combination.*

**Response:**

**Paradiso ignores that Mueller attorneys, during the discovery period, did not provide responsible or reasonable responses to the Rein Tech interrogatories (See Exhibit D), and did not provide production of documents or actual products as requested. These deficiencies were presented in the Klicpera's Expert Witness Report. Conversely, the Rein Tech sent Mueller's attorneys Rein Tech team emails, engineering drawings, pages from discovery documents, file histories, and two base stations (water meters) with communication hubs from its residential field study.**

**The '837 Claim Chart provided to the Defendant incorporates the Certificate of Correction claim language. Mueller, states "Why Mueller Cellular Node?" and "Enhanced Security: Mueller has implemented security measures to provide data protection on the user interface, critical field devices, and utility IT data systems. Amazon Web Service (AWS) provides an added level of protection of the utility, homeowner and business data." (Exhibit 9 in Klicpera's Expert Witness Report)**

**Furthermore, shown in Exhibits G is the mobileRDM (a phone app and device) that shows the signal strength, presets, battery voltage, and firmware version of a particular water meter that has been paired and authenticated.**

**Exhibits G and J display a mobileRDM that demonstrates a cell phone with a Meuller water APP to remotely connect or disconnect water services using a two-way radio. While a user or a corporate car is within 1000 feet a service connection, selecting a function on the Mueller water APP a signal is transferred to the Mueller water meter. The water meter 25-30 second process (pairing the mobileRDM) confirms that the user signal has**

**been sent. Once connected with the mobileRDM application, water service can be connected or disconnected. The mobileRDM application confirms to the user when the process is complete. One of the phone settings is the Reset (or Preset) button.**

**Attached in Exhibits G is a Mobile APP Mueller document which describes Benefits of AMR/AMI Systems at the Touch of a Button. With the mobileRDM application, utility workers can remotely check the status of service connections, read meters, and connect or disconnect water service all from an Android smart phone using a 2-way radio connection. The application does not require an automated meter reading or advanced metering infrastructure system, but it can be used on any existing system. Another benefit of the application is that utilities can deploy it incrementally and expand its use to other geographic service areas without significant capital expenditures.**

**Even if the Defendant were successful in claiming their Cellular Node does not use authentication or encryption, then the Defendant is still infringing under the Doctrine of Equivalents per MPEP 2186 Relationship to the Doctrine of Equivalents [R-07.2022]. The Doctrine of Equivalents arises in the context of an infringement action. If an accused product or process does not literally infringe a patented invention, the accused product or process may be found to infringe under the Doctrine of Equivalents. The essential objective inquiry is: "Does the accused product or process contain elements identical or equivalent to each claimed element of the patented invention?" *Warner-Jenkinson Co. v. Hilton Davis Chemical Co.,* 520 U.S. 17, 40, 41 USPQ2d 1865, 1875 (1997). In determining equivalence, "[a]n analysis of the role played by each element in the context of the specific patent claim will thus inform the inquiry as to whether a substitute element matches the function, way, and result of the claimed element, or whether the substitute plays a role substantially different from the claimed element." 520 U.S. at 40, 41 USPQ2d at 1875. Encryption and**

**authentication is critical and implied by the security. Mueller has implemented security measures to provide data protection on the user interface, critical field devices, and utility IT data systems. Amazon Web Service (AWS) provides an added level of protection of the utility, homeowner and business data. If a command signal is sent by the operations center that a leak has been detected as a particular residence, some form an authentication is necessary that the command signal only turns off the desired water meter.**

Mr. Paradiso's Opinion:

*43. Further, it is my understanding from my conversations with Mueller Systems employees that the 420RDM with Cellular Node does not use authentication and encryption technologies for pairing operations as required by this limitation; therefore, claim 42 is not infringed.*

**Response:**

**Paradiso ignores that Mueller attorneys, during the discovery period, did not provide responsible or reasonable responses to the Rein Tech interrogatories (See Exhibit D), and did not provide production of documents or actual products as requested. These deficiencies were presented in the Klicpera's Expert Witness Report. Conversely, the Rein Tech sent Mueller's attorneys Rein Tech team emails, engineering drawings, pages from discovery documents, file histories, and two base stations (water meters) with communication hubs from its residential field study.**

**The '837 Claim Chart provided to the Defendant incorporates the Certificate of Correction claim language. Mueller, states "Why Mueller Cellular Node?" and "Enhanced Security: Mueller has implemented security measures to provide data protection on the user interface, critical field devices, and utility IT data systems. Amazon Web Service**

**(AWS) provides an added level of protection of the utility, homeowner and business data." (Exhibit 9 in Klicpera's Expert Witness Report)**

**Furthermore, shown in Exhibit G is the mobileRDM (a phone app and device) that shows the signal strength, presets, battery voltage, and firmware version of a particular water meter that has been paired and authenticated.**

**Exhibits G and J display a mobileRDM that demonstrates a cell phone with a Meuller water APP to remotely connect or disconnect water services using a two-way radio. While a user or a corporate car is within 1000 feet a service connection, selecting a function on the Mueller water APP a signal is transferred to the Mueller water meter. The water meter 25-30 second process (pairing the mobileRDM) confirms that the user signal has been sent. Once connected with the mobileRDM application, water service can be connected or disconnected. The mobileRDM application confirms to the user when the process is complete. One of the phone settings is the Reset (or Preset) button.**

**Attached in Exhibits G is a Mobile APP Mueller document which describes Benefits of AMR/AMI Systems at the Touch of a Button. With the mobileRDM application, utility workers can remotely check the status of service connections, read meters, and connect or disconnect water service all from an Android smart phone using a 2-way radio connection. The application does not require an automated meter reading or advanced metering infrastructure system, but it can be used on any existing system. Another benefit of the application is that utilities can deploy it incrementally and expand its use to other geographic service areas without significant capital expenditure.**

**Even if the Defendant were successful in claiming their Cellular Node does not use authentication or encryption, then the Defendant is still infringing under the Doctrine of Equivalents per MPEP 2186 Relationship to the Doctrine of Equivalents [R-07.2022]. The**

**Doctrine of Equivalents arises in the context of an infringement action. If an accused product or process does not literally infringe on a patented invention, the accused product or process may be found to infringe under the Doctrine of Equivalents. The essential objective inquiry is: "Does the accused product or process contain elements identical or equivalent to each claimed element of the patented invention?"** ***Warner-Jenkinson Co. v. Hilton Davis Chemical Co.,*** **520 U.S. 17, 40, 41 USPQ2d 1865, 1875 (1997). In determining equivalence, "[a]n analysis of the role played by each element in the context of the specific patent claim will thus inform the inquiry as to whether a substitute element matches the function, way, and result of the claimed element, or whether the substitute plays a role substantially different from the claimed element." 520 U.S. at 40, 41 USPQ2d at 1875. Encryption and authentication is critical and implied by the security. Mueller has implemented security measures to provide data protection on the user interface, critical field devices, and utility IT data systems. Amazon Web Service (AWS) provides an added level of protection of the utility, homeowner and business data. If a command signal is sent by the operations center that a leak has been detected as a particular residence, some form an authentication is necessary that the command signal only turns off the desired water meter.**

Mr. Paradiso's Opinion:

*44. As noted in my opening report on invalidity, this limitation is indefinite in my opinion. However, as best understood, the recitation of "long-range LoRa, Sigfox, UNB, NB-IoT, 6LoWPAN, WiMAX, cellular technology 3GPP and LTE-M and 5G" refers back to the recitation of "at least one of a LoRa, Sigfox, Ultra Narrow Band 6LowPAN, NB-IoT, LTE-M cellular, and 5G cellular technology" in element d). The claim indicates that the "at least one of a LoRa,*

*Sigfox, Ultra Narrow Band 6LowPAN, NB-IoT, LTE-M cellular, and 5G cellular technology" of element. d) one or more wireless communication technologies comprising at least one of a LoRa, Sigfox, Ultra Narrow Band 6LowPAN, NB-IoT, LTE-M cellular, and 5G cellular technology"). It is my understanding that the alleged one or more wireless communication technologies of the alleged base station neither "receive at least one of a water use data, water energy use data, water quality data and leak detection information" nor "send commands to regulate the control valve mechanism." Instead, the 420RDM with Cellular Node sends meter readings and receives remote commands to operate its valve mechanism.*

**Response:**

**Paradiso continues to ignore the Certificate of Correction using the pre-CofC claim language which is presented with strikeout applied. The CofC claim is presented in bold.**

~~wherein the long-range LoRa, Sigfox, UNB, NB-IoT, 6LoWPAN, WiMAX, cellular technology 3GPP and LTE-M and 5G consist of a duplex technology to both receive at least one of a water use data, water energy use data, water quality data and leak detection information and send commands to regulate the control valve mechanism;~~

**wherein the one or more wireless communication technologies comprising at least one of the LoRa, the Sigfox, the Ultra Narrow Band (UNB), the 6LoWPAN, the WiMAX, the NB-IoT, the 3GPP cellular, the 4G/LTE-M cellular, or the 5G cellular technology, or any combination thereof, consists of a duplex technology to transmit the water use data, the water energy use data, the water quality data, or the leak detection information, or any combination thereof, and send commands to regulate the water control valve mechanism;**

**Paradiso continues to ignore the claims defined in the '837 Certificate of Correction, which shows:**

> **Claim 42, element d) one or more wireless communication technologies comprising at least one of a LoRa, a Sigfox, an U1tra Narrow Band (UNB), a 6LoWPAN, a WiMAX, a NB-IoT, a 3GPP cellular, a 4G/LTE-M cellular, or a 5G cellular technology, or any combination thereof;**
>
> **Claim 42, element f) wherein the one or more wireless communication technologies comprising at least one of the LoRa, the Sigfox, the Ultra Narrow Band (UNB), the 6LoWPAN, the WiMAX, the NB-IoT, the 3GPP cellular, the 4G/LTE-M cellular, or the 5G cellular technology, or any combination thereof, consists of a duplex technology to transmit the water use data, the water energy use data, the water quality data, or the leak detection information, or any combination thereof, and send commands to regulate the water control valve mechanism;**

**Thus, the '837 Certificate of Correction lists of wireless communication technologies is aligned in Claim 42 elements d and f. Also, Claim 42 states that duplex technology transmits water data and sends (remote) commands to regulate the water control valve mechanism.**

**A POSITA would understand that Claim 42 includes the limitation of "wherein the one or more wireless communication technologies comprising at least one of the LoRa, the Sigfox, the Ultra Narrow Band (UNB), the 6LoWPAN, the WiMAX, the NB-IoT, the 3GPP cellular, the 4G/LTE-M cellular, or the 5G cellular technology, or any combination thereof, consists of a duplex technology to transmit the water use data, the water energy use data, the water quality data, or the leak detection information, or any combination thereof, and send commands to regulate the water control valve mechanism".**

Mr. Paradiso's Opinion:

*45. Accordingly, a POSA would not understand the Cellular Combination to include the limitation of wherein the long-range LoRa, Sigfox, UNB, NB-IoT, 6LoWPAN, WiMAX, cellular technology 3GPP and LTE-M and 5G consist of a duplex technology to both receive at least one of a water use data, water energy use data, water quality data and leak detection information and send commands to regulate the control valve mechanism.*

**Response:**

**Paradiso continues to ignore the Certificate of Correction using the pre-CofC claim language which is presented with strikeout applied. The CofC claim is presented in bold.**

~~wherein the long-range LoRa, Sigfox, UNB, NB-IoT, 6LoWPAN, WiMAX, cellular technology 3GPP and LTE-M and 5G consist of a duplex technology to both receive at least one of a water use data, water energy use data, water quality data and leak detection information and send commands to regulate the control valve mechanism;~~

**wherein the one or more wireless communication technologies comprising at least one of the LoRa, the Sigfox, the Ultra Narrow Band (UNB), the 6LoWPAN, the WiMAX, the NB-IoT, the 3GPP cellular, the 4G/LTE-M cellular, or the 5G cellular technology, or any combination thereof, consists of a duplex technology to transmit the water use data, the water energy use data, the water quality data, or the leak detection information, or any combination thereof, and send commands to regulate the water control valve mechanism;**

**Paradiso continues to ignore the claims defined in the '837 Certificate of Correction, which shows:**

**Claim 42, element d) one or more wireless communication technologies comprising at least one of a LoRa, a Sigfox, an U1tra Narrow Band (UNB), a 6LoWPAN, a WiMAX, a NB-IoT, a 3GPP cellular, a 4G/LTE-M cellular, or a 5G cellular technology, or any combination thereof;**

**Claim 42, element f) wherein the one or more wireless communication technologies comprising at least one of the LoRa, the Sigfox, the Ultra Narrow Band (UNB), the 6LoWPAN, the WiMAX, the NB-IoT, the 3GPP cellular, the 4G/LTE-M cellular, or the 5G cellular technology, or any combination thereof, consists of a duplex technology to transmit the water use data, the water energy use data, the water quality data, or the leak detection information, or any combination thereof, and send commands to regulate the water control valve mechanism;**

**Thus, the '837 Certificate of Correction lists of wireless communication technologies is aligned in Claim 42 elements d and f. Also, Claim 42 states that duplex technology transmits water data and sends (remote) commands to regulate the water control valve mechanism.**

**A POSITA would understand that Claim 42 includes the limitation of "wherein the one or more wireless communication technologies comprising at least one of the LoRa, the Sigfox, the Ultra Narrow Band (UNB), the 6LoWPAN, the WiMAX, the NB-IoT, the 3GPP cellular, the 4G/LTE-M cellular, or the 5G cellular technology, or any combination thereof, consists of a duplex technology to transmit the water use data, the water energy use data, the water quality data, or the leak detection information, or any combination thereof, and send commands to regulate the water control valve mechanism".**

Mr. Paradiso's Opinion:

*46. Mueller does not directly infringe Claim 42 because the wireless communication technology of the 420RDM (with Cellular or LoRaWAN Node) does not receive "water use data, water energy use data, water quality data and leak detection information" or "send commands to regulate the control valve mechanism." Water use data is transmitted (not received) by the wireless communication technology of the 420RDM (with Cellular or LoRaWAN Node) and commands are received (not transmitted) by the wireless communication technology of the 420RDM (with Cellular or LoRaWAN Node). Additionally, these limitations can only be met (if at all) when the Cellular Combination is installed and used by a customer; therefore, Mueller cannot directly infringe this claim by selling, offering for sale, making, or importing the Accused Products. Rein Tech's contentions do not provide any indication or cite any evidence that Mueller is responsible for installing the Cellular Combination nor using the completed system after installation.*

**Response:**

**Paradiso continues to ignore the Certificate of Correction using the pre-CofC claim language which is presented with strikeout applied. The CofC claim is presented in bold.**

~~wherein the long-range LoRa, Sigfox, UNB, NB-IoT, 6LoWPAN, WiMAX, cellular technology 3GPP and LTE-M and 5G consist of a duplex technology to both receive at least one of a water use data, water energy use data, water quality data and leak detection information and send commands to regulate the control valve mechanism;~~

**wherein the one or more wireless communication technologies comprising at least one of the LoRa, the Sigfox, the Ultra Narrow Band (UNB), the 6LoWPAN, the WiMAX, the NB-IoT, the 3GPP cellular, the 4G/LTE-M cellular, or the 5G cellular technology, or any combination thereof, consists of a duplex technology to transmit the water use data, the water energy use data, the water quality data, or the leak**

**detection information, or any combination thereof, and send commands to regulate the water control valve mechanism;**

**Paradiso continues to ignore the claims defined in the '837 Certificate of Correction, which shows:**

**Claim 42, element d) one or more wireless communication technologies comprising at least one of a LoRa, a Sigfox, an U1tra Narrow Band (UNB), a 6LoWPAN, a WiMAX, a NB-IoT, a 3GPP cellular, a 4G/LTE-M cellular, or a 5G cellular technology, or any combination thereof;**

**Claim 42, element f) wherein the one or more wireless communication technologies comprising at least one of the LoRa, the Sigfox, the Ultra Narrow Band (UNB), the 6LoWPAN, the WiMAX, the NB-IoT, the 3GPP cellular, the 4G/LTE-M cellular, or the 5G cellular technology, or any combination thereof, consists of a duplex technology to transmit the water use data, the water energy use data, the water quality data, or the leak detection information, or any combination thereof, and send commands to regulate the water control valve mechanism;**

**Thus, the '837 Certificate of Correction lists of wireless communication technologies is aligned in Claim 42 elements d and f. Also, Claim 42 states that duplex technology transmits water data and sends (remote) commands to regulate the water control valve mechanism.**

**A POSITA would understand that Claim 42 includes the limitation of "wherein the one or more wireless communication technologies comprising at least one of the LoRa, the Sigfox, the Ultra Narrow Band (UNB), the 6LoWPAN, the WiMAX, the NB-IoT, the 3GPP cellular, the 4G/LTE-M cellular, or the 5G cellular technology, or any combination thereof,**

**consists of a duplex technology to transmit the water use data, the water energy use data, the water quality data, or the leak detection information, or any combination thereof, and send commands to regulate the water control valve mechanism".**

**Plaintiff provided evidence that Mueller is responsible for installing the Cellular Combination (refer to Exhibit A, which contains exhibit pages from Klicpera's Expert Witness Report). Plaintiff's Research Attorney discovered the agreement for Mueller water meter installations in Newport Beach, CA beginning in 2023. This exhibit was previously provided to Paradiso but he apparently ignored it. This exhibited Purchase, Installation and Maintenance Amended Agreement, dated the 25th of May 2023 (after the '837 Patent issue date), was signed by Mueller Systems, LLC Vice President/General Manager Eric Stacey and Assistant Secretary Chason Carroll. This Agreement states that Mueller System, LLC would be paid eight million, one hundred and fifty thousand dollars ("8,150,000.00"). Contractor Mueller would be required for all Work performed in accordance with this Agreement including all reimbursable items, subcontractor fees, for the base contract amount. Hence, while Mueller states that they did not install the infringing water meters, they were paid for such and were responsible for the plumbing installers or contractors and work. Mueller most likely installed their network system and developed the software for the Sentryx API for communicating with Amazon Web Services ("AWS"). Defendant Mueller maintains water data databases at the AWS and network operation center in Atlanta and likely elsewhere (web portal). Defendant Mueller Attorneys completely failed to disclose the Newport Beach water district and the $8,150,000 contract. It can be assumed that Mueller would use the same procedure, i.e., Purchase, Installation and Maintenance Agreement, with other sites that Mueller had not disclosed, including**

**Calaveras County, California; Santa Rosa County, Florida; Dayton Beach, Florida; West Slope, Oregon, and any other nondisclosed sites.**

**Furthermore, Defendant Mueller provides instructions on how to install their water meters and how to connect to the cellular or LoRa network. (See Exhibits B and C)**

**Mueller's Installed Water Meter**

Mr. Paradiso's Opinion:

*47. The Accused Products do not directly infringe this claim because the Accused Products do not meet this limitation because the wireless communication technology of the 420RDM (with Cellular or LoRaWAN Node) does not receive "water use data, water energy use data, water quality data and leak detection information" or "send commands to regulate the control valve mechanism." Water use data is transmitted (not received) by the wireless communication technology of the 420RDM (with Cellular or LoRaWAN Node) and commands are received (not transmitted) by the wireless communication technology of the 420RDM (with Cellular or LoRaWAN Node).*

**Response:**

**Paradiso continues to ignore the claims defined in the '837 Certificate of Correction, which shows:**

**Claim 42, element d) one or more wireless communication technologies comprising at least one of a LoRa, a Sigfox, an U1tra Narrow Band (UNB), a 6LoWPAN, a WiMAX, a NB-IoT, a 3GPP cellular, a 4G/LTE-M cellular, or a 5G cellular technology, or any combination thereof;**

**Claim 42, element f) wherein the one or more wireless communication technologies comprising at least one of the LoRa, the Sigfox, the Ultra Narrow Band (UNB), the 6LoWPAN, the WiMAX, the NB-IoT, the 3GPP cellular, the 4G/LTE-M cellular, or the 5G cellular technology, or any combination thereof, consists of a duplex technology to transmit the water use data, the water energy use data, the water quality data, or the leak detection information, or any combination thereof, and send commands to regulate the water control valve mechanism;**

**Thus, the '837 Certificate of Correction lists of wireless communication technologies is aligned in Claim 42 elements d and f. Also, Claim 42 states that duplex technology transmits water data and sends (remote) commands to regulate the water control valve mechanism.**

**A POSITA would understand that Claim 42 includes the limitation of "wherein the one or more wireless communication technologies comprising at least one of the LoRa, the Sigfox, the Ultra Narrow Band (UNB), the 6LoWPAN, the WiMAX, the NB-IoT, the 3GPP cellular, the 4G/LTE-M cellular, or the 5G cellular technology, or any combination thereof, consists of a duplex technology to transmit the water use data, the water energy use data, the water quality data, or the leak detection information, or any combination thereof, and send commands to regulate the water control valve mechanism".**

Mr. Paradiso's Opinion:

*48. In my opinion, these limitations are not met by the Cellular Combination for several reasons.*

*49. First, Rein Tech's contentions do not include any support whatsoever for its allegation that the Cellular Combination "include[s] one of a programming setting managed by the user, remotely a mode setting, and a default or restricted setting processed by the manufacturing factory." Accordingly, Rein Tech has not shown that these limitations are met, and a POSA would not understand the LoRaWAN Combination to include these limitations.*

**Response:**

**Paradiso continues to ignore the Certificate of Correction using the pre-CofC claim language which is presented with strikeout applied. The CofC claim is presented in bold.**

~~the CPU, microprocessor or microcontroller can at least include one of a programming setting managed by the user, remotely a mode setting, and a default or restricted setting processed by the manufacturing factory to: a) record the water flow event to a local memory bank or removable memory device for regional or controlled analysis, b) combine a plurality of water low events into a local memory bank and subsequently schedule the transfer of the water flow event dataset to a remote computer or server, or to a cloud service company, c) directly transfer the water .flow event to a remote computer or server, or to a cloud service company, or d) transfer the water flow data utilizing a blockchain format to one or more remote computers or servers, or cloud service company; and,~~

**the CPU, the microprocessor, or the microcontroller, or any combination thereof, includes at least one of a programming setting managed by a user to remotely set a mode setting or modify a default setting processed by a manufacturer to: a) record a water flow event to an integrated memory bank or a removable memory device for analysis; b) combine a plurality of water flow events into the integrated memory bank and subsequently schedule the transfer of the water flow events to a one or more**

**remote computers or servers or to a cloud computing company; c) transfer the water flow event to the one or more remote computers or servers or to the cloud computing company; d) transfer the water data or information utilizing a blockchain technology to the one or more remove computers or servers or to the cloud computing company;**

**The '837 Claim Chart provided to the Defendant incorporates the Certificate of Correction claim language.**

**In regard to Claim 42, element "record a water flow event to an integrated memory bank or a removable memory device for analysis;":**

**The Mueller 420 RDM and SSM with Mi.Net® LW Meter Interface and Cellular Node Meter Interface with Mi.Net® record the water flow event to a local memory bank or removable memory device for analysis; "Information retrieved from a water meter is stored temporarily with the node's non-volatile internal memory", and "Logs and stores 105 days of hourly data meter data in internal memory" (Exhibit 1 at RT009366 in Klicpera's Expert Witness Report); "2MB Solid-state Flash Memory for dedicated storage of readings" and "Configurable data storage" . . . 8-digit electronic reading in ACSII format where it can be recorded and maintained . . ." (Exhibit 11 at MUE000000341 and the SSM water meter in Exhibit 23 at MUE000000148 in Klicpera's Expert Witness Report); "Network Operations Center" (Exhibit 7 at RT009377 and Exhibit 10 at RT009394 in Klicpera's Expert Witness Report).**

**In regard to Claim 42, element "combine a plurality of water flow events into the integrated memory bank and subsequently schedule the transfer of the water flow events to a one or more remote computers or servers or to a cloud computing company;":**

**The Mueller 420 RDM and SSM with Mi.Net® LW Meter Interface and Cellular Node Meter Interface with Mi.Net® "<u>The node transmits water meter data</u> to the LoRaWAN <u>network daily</u>", (Exhibit 2 at RT009368 and Exhibit 16 at Bates No. MUE000000053-MUE000000054 in Klicpera's Expert Witness Report). (underlining added)**

**In regard to Claim 42, element "transfer the water flow event to the one or more remote computers or servers or to the cloud computing company;":**

**The Mueller 420 RDM and SSM with Mi.Net® LW Meter Interface and Cellular Node Meter Interface with Mi.Net®, <u>"Amazon Web Service (AWS) provides an added level of protection of the utility, homeowner and business data"</u> (Exhibit 13 at RT009400 and Exhibit 16 at Bates No. MUE000000053-MUE000000054 in Klicpera's Expert Witness Report). (underlining added)**

Mr. Paradiso's Opinion:

*50. Second, these limitations identify numerous functions a-d, none of which can be performed by the Cellular Combination prior to installation. For example, each requires a "water flow event" and/or "water flow data." Prior to installation, the Accused Products are not in communication with any water source; therefore, there can be no "water flow event" and/or "water flow data." Accordingly, the Accused Products do not infringe at the time the products are sold, offered for sale, imported, or made. Rein Tech's contentions do not provide any indication or cite any evidence that Mueller is responsible for installing the Cellular Combination nor using the completed system after installation.*

**Response:**

**Paradiso continues to disregard the '837 Certificate of Corrections and, thus, his opinions are erroneous. He is unqualified to refute the decisions of the trained and qualified Patent Examiner and Supervisor, and approval by the Director of the USPTO.**

**Plaintiff provided evidence that Mueller is responsible for installing the Cellular Combination (refer to Exhibit A, which contains exhibit pages from Klicpera's Expert Witness Report). Plaintiff's Research Attorney discovered the agreement for Mueller water meter installations in Newport Beach, CA beginning in 2023. This exhibit was previously provided to Paradiso but he apparently ignored it. This exhibited Purchase, Installation and Maintenance Amended Agreement, dated the 25th of May 2023 (after the '837 Patent issue date), was signed by Mueller Systems, LLC Vice President/General Manager Eric Stacey and Assistant Secretary Chason Carroll. This Agreement states that Mueller System, LLC would be paid eight million, one hundred and fifty thousand dollars ("8,150,000.00"). Contractor Mueller would be required for all Work performed in accordance with this Agreement including all reimbursable items, subcontractor fees, for the base contract amount. Hence, while Mueller states that they did not install the infringing water meters, they were paid for such and were responsible for the plumbing installers or contractors and work. Mueller most likely installed their network system and developed the software for the Sentryx API for communicating with Amazon Web Services ("AWS"). Defendant Mueller maintains water data databases at the AWS and network operation center in Atlanta and likely elsewhere (web portal). Defendant Mueller Attorneys completely failed to disclose the Newport Beach water district and the $8,150,000 contract. It can be assumed that Mueller would use the same procedure, i.e., Purchase, Installation and Maintenance Agreement, with other sites that Mueller had not disclosed, including**

**Calaveras County, California; Santa Rosa County, Florida; Dayton Beach, Florida; West Slope, Oregon, and any other nondisclosed sites.**

**Furthermore, Defendant Mueller provides instructions on how to install their water meters and how to connect to the cellular or LoRa network. (See Exhibits B and C)**

**Mueller's Installed Water Meter**

Mr. Paradiso's Opinion:

*51. Mueller does not directly infringe Claim 42 because the wireless communication technology of the Accused Product is not capable of "transmitting at least one of a 1) water use data, water energy use data, water quality data and leak detection information and, 2) obtains an instruction or signal" when the Accused Product is made, sold, offered for sale or imported by Mueller. Such can occur (if at all) only after installation and during use of the Accused Product by a customer. Rein Tech's contentions do not provide any indication or cite any evidence that Mueller is responsible for installing the Cellular Combination nor using the completed system after installation.*

**Response:**

**Paradiso continues to ignore the Certificate of Correction using the pre-CofC claim language which is presented with strikeout applied. The CofC claim is presented in bold.**

~~the one or more wireless communication technologies capable of transmitting at least one of a 1) water use data, water energy use data, water quality data and leak detection information and, 2) obtains an instruction or signal to command the management of the water control valve or perform a command operation, using at least one of an Internet connection, a private network system, and a corporate owned network system, and a smart phone, computer, server, tablet, web portal, and other electronic communication device, that communicates with at least one of a remote computer or server, a commercial cloud company, and a web-based company."~~

**the one or more wireless communication technologies configured to: (i) transmit at least one of the water use data, the water energy use data, the water quality data, or the leak detection information, or any combination thereof, to the one or more remote computers or servers or to the cloud computing company; and (ii) receive an instruction or signal to command the management of the water control valve mechanism or perform another command operation; using at least one of an Internet connection, a private network system, or a corporate owned network system that communicates with a smart phone, a computer, a server, a tablet, a web portal, or another electronic communication device.**

**The '837 Claim Chart provided to the Defendant incorporates the Certificate of Correction claim language.**

**Per Mueller, "REMOTE DISCONNECT ENABLED COMPATIBILITY - Eliminate the need for truck rolls; the node is compatible with Mueller Systems 420RDM. Utilities can remotely initiate a command to turn water service on or off" (Exhibit 2 at RT009369 in Klicpera's Expert Witness Report); "Remote Disconnect Enabled Compatibility" and**

**"Compatible with Mueller System 420 RDM, water utilities can remotely initiate a command to turn a water service on or off" (Exhibit 3 at RT009371 in Klicpera's Expert Witness Report); "The Mi.Net LW node has the built-in capability to seamlessly connect with Mueller Systems Model 420 RDM (Remote Disconnect Meter) that allows easy and secure remote valve actuation to turn water service on or off." (Exhibit 4 at RT009376 in Klicpera's Expert Witness Report).**

**Plaintiff provided evidence that Mueller is responsible for installing the Cellular Combination (refer to Exhibit A, which contains exhibit pages from Klicpera's Expert Witness Report). Plaintiff's Research Attorney discovered the agreement for Mueller water meter installations in Newport Beach, CA beginning in 2023. This exhibit was previously provided to Paradiso but he apparently ignored it. This exhibited Purchase, Installation and Maintenance Amended Agreement, dated the 25th of May 2023 (after the '837 Patent issue date), was signed by Mueller Systems, LLC Vice President/General Manager Eric Stacey and Assistant Secretary Chason Carroll. This Agreement states that Mueller System, LLC would be paid eight million, one hundred and fifty thousand dollars ("8,150,000.00"). Contractor Mueller would be required for all Work performed in accordance with this Agreement including all reimbursable items, subcontractor fees, for the base contract amount. Hence, while Mueller states that they did not install the infringing water meters, they were paid for such and were responsible for the plumbing installers or contractors and work. Mueller most likely installed their network system and developed the software for the Sentryx API for communicating with Amazon Web Services ("AWS"). Defendant Mueller maintains water data databases at the AWS and network operation center in Atlanta and likely elsewhere (web portal). Defendant Mueller Attorneys completely failed to disclose the Newport Beach water district and the $8,150,000 contract.**

**It can be assumed that Mueller would use the same procedure, i.e., Purchase, Installation and Maintenance Agreement, with other sites that Mueller had not disclosed, including Calaveras County, California; Santa Rosa County, Florida; Dayton Beach, Florida; West Slope, Oregon, and any other nondisclosed sites.**

**Furthermore, Defendant Mueller provides instructions on how to install their water meters and how to connect to the cellular or LoRa network. (See Exhibits B and C)**

**Mueller's Installed Water Meter**

Mr. Paradiso's Opinion:

***52.*** *Additionally, Mueller does not directly infringe because it is my understanding that the Accused Product is not made, sold, offered for sale, or imported by Mueller with "a smart phone, computer, server, tablet, web portal, and other electronic communication device." Even if this were not the case, the smart phone, computer, server, tablet, web portal, and other electronic communication device does not "communicate[] with at least one of a remote computer or server, a commercial cloud-company, and a web-based company" when the Accused Product is made, sold, offered for sale, or imported by Mueller. Such can occur (if at all) only after installation and during use of the Accused Product by a customer. Rein Tech's contentions do not provide any indication or cite any evidence that Mueller is responsible for installing the Cellular Combination nor using the completed system after installation.*

**Response:**

**Exhibits G and J display a mobileRDM that demonstrates a cell phone with a Meuller water APP to remotely connect or disconnect water services using a two-way radio. While a user or a corporate car is within 1000 feet a service connection, selecting a function on the Mueller water APP a signal is transferred to the Mueller water meter. The water meter 25-30 second process (pairing the mobileRDM) confirms that the user signal has been sent. Once connected with the mobileRDM application, water service can be connected or disconnected. The mobileRDM application confirms to the user when the process is complete. One of the phone settings is the Reset (or Preset) button.**

**Attached in Exhibit G is a Mobile APP Mueller document which describes Benefits of AMR/AMI Systems at the Touch of a Button. With the mobileRDM application, utility workers can remotely check the status of service connections, read meters, and connect or disconnect water service all from an Android smart phone using a 2-way radio connection. The application does not require an automated meter reading or advanced metering infrastructure system, but it can be used on any existing system. Another benefit of the application is that utilities can deploy it incrementally and expand its use to other geographic service areas without significant capital expenditure.**

**Plaintiff has evidence that Mueller Systems was selected by Pace Water System in Santa Rosa County, Florida, to deploy a pilot program for their water meter system which includes new features that allow customers to control their meter from a mobile phone (Exhibit I). The integration uses Mueller's Sentryx API (Application Programming Interface) to integrate the existing system with a customer-facing mobile app from Dropcountr, a cloud-based data analytics and customer engagement application for water utilities. Customers who opt in can see their hourly water usage and turn their water on or**

**off from their phone. This app gives customers the ability to remotely control the water supply to their house.**

**Plaintiff has evidence that Mueller was responsible for installing, testing, and maintaining the corporate network per their agreement with Newport Beach, California (Exhibits B and C). Mueller trained utility workers to use the corporate network that Muller installed. These activities were contracted per a major (single) sale agreement between Defendant Mueller and the City of Newport Beach, California.**

**Plaintiff provided evidence that Mueller is responsible for installing the Cellular Combination (refer to Exhibit A, which contains exhibit pages from Klicpera's Expert Witness Report). Plaintiff's Research Attorney discovered the agreement for Mueller water meter installations in Newport Beach, CA beginning in 2023. This exhibit was previously provided to Paradiso, but he apparently ignored it. This exhibited Purchase, Installation and Maintenance Amended Agreement, dated the 25th of May 2023 (after the '837 Patent issue date), was signed by Mueller Systems, LLC Vice President/General Manager Eric Stacey and Assistant Secretary Chason Carroll. This Agreement states that Mueller System, LLC would be paid eight million, one hundred and fifty thousand dollars ("8,150,000.00"). Contractor Mueller would be required for all Work performed in accordance with this Agreement including all reimbursable items, subcontractor fees, for the base contract amount. Hence, while Mueller states that they did not install the infringing water meters, they were paid for such and were responsible for the plumbing installers or contractors and work. Mueller most likely installed their network system and developed the software for the Sentryx API for communicating with Amazon Web Services ("AWS"). Defendant Mueller maintains water data databases at the AWS and network operation center in Atlanta and likely elsewhere (web portal). Defendant Mueller Attorneys**

**completely failed to disclose the Newport Beach water district and the $8,150,000 contract. It can be assumed that Mueller would use the same procedure, i.e., Purchase, Installation and Maintenance Agreement, with other sites that Mueller had not disclosed, including Calaveras County, California; Santa Rosa County, Florida; Dayton Beach, Florida; West Slope, Oregon, and any other nondisclosed sites.**

**Furthermore, Defendant Mueller provides instructions on how to install their water meters and how to connect to the cellular or LoRa network. (See Exhibits B and C)**

**Mueller's Installed Water Meter**

**2) CLAIM 45**

Mr. Paradiso's Opinion:

None given.

**Response:**

**No response provided since no there was no opinion.**

**3) CLAIM 47**

Mr. Paradiso's Opinion:

*53. In my opinion, Claim 47 is not directly infringed by the Cellular Combination for the reasons similar to those discussed in the preceding subsection. For example, the Accused*

*Products do not include "a smart phone, computer, server, tablet, web portal [or] one or more other electronic communication devices." The Accused Products are not made, sold, offered for sale, or imported by Mueller with "a smart phone, computer, server, tablet, web portal [or] one or more other electronic communication devices." Even if this were not the case, the smart phone, computer, server, tablet, web portal [or] one or more other electronic communication devices is not capable of being "used" to perform any of the functions recited in this limitation when the Accused Product is made, sold, offered for sale, or imported by Mueller. Such can occur (if at all) only after installation and during use of the Accused Product by a customer. Rein Tech's contentions do not provide any indication or cite any evidence that Mueller is responsible for installing the Cellular Combination nor using the completed system after installation.*

**Response:**

**Exhibits G and J display a mobileRDM that demonstrates a cell phone with a Meuller water APP to remotely connect or disconnect water services using a two-way radio. While a user or a corporate car is within 1000 feet a service connection, selecting a function on the Mueller water APP a signal is transferred to the Mueller water meter. The water meter 25-30 second process (pairing the mobileRDM) confirms that the user signal has been sent. Once connected with the mobileRDM application, water service can be connected or disconnected. The mobileRDM application confirms to the user when the process is complete. One of the phone settings is the Reset (or Preset) button.**

**Attached in Exhibits G is a Mobile APP Mueller document which describes Benefits of AMR/AMI Systems at the Touch of a Button. With the mobileRDM application, utility workers can remotely check the status of service connections, read meters, and connect or disconnect water service all from an Android smart phone using a 2-way radio connection. The application does not require an automated meter reading or advanced metering**

**infrastructure system, but it can be used on any existing system. Another benefit of the application is that utilities can deploy it incrementally and expand its use to other geographic service areas without significant capital expenditure.**

**Plaintiff has evidence that Mueller Systems was selected by Pace Water System in Santa Rosa County, Florida, to deploy a pilot program for their water meter system which includes new features that allow customers to control their meter from a mobile phone (Exhibit I). The integration uses Mueller's Sentryx API (Application Programming Interface) to integrate the existing system with a customer-facing mobile app from Dropcountr, a cloud-based data analytics and customer engagement application for water utilities. Customers who opt in can see their hourly water usage and turn their water on or off from their phone. This app gives customers the ability to remotely control the water supply to their house.**

**Plaintiff has evidence that Mueller was responsible for installing, testing, and maintaining the corporate network per their agreement with Newport Beach, California (Exhibits B and C). Mueller trained utility workers to use the corporate network that Muller installed. These activities were contracted per a major (single) sale agreement between Defendant Mueller and the City of Newport Beach, California.**

**Plaintiff provided evidence that Mueller is responsible for installing the Cellular Combination (refer to Exhibit A, which contains exhibit pages from Klicpera's Expert Witness Report). Plaintiff's Research Attorney discovered the agreement for Mueller water meter installations in Newport Beach, CA beginning in 2023. This exhibit was previously provided to Paradiso, but he apparently ignored it. This exhibited Purchase, Installation and Maintenance Amended Agreement, dated the 25th of May 2023 (after the '837 Patent issue date), was signed by Mueller Systems, LLC Vice President/General**

**Manager Eric Stacey and Assistant Secretary Chason Carroll. This Agreement states that Mueller System, LLC would be paid eight million, one hundred and fifty thousand dollars ("8,150,000.00"). Contractor Mueller would be required for all Work performed in accordance with this Agreement including all reimbursable items, subcontractor fees, for the base contract amount. Hence, while Mueller states that they did not install the infringing water meters, they were paid for such and were responsible for the plumbing installers or contractors and work. Mueller most likely installed their network system and developed the software for the Sentryx API for communicating with Amazon Web Services ("AWS"). Defendant Mueller maintains water data databases at the AWS and network operation center in Atlanta and likely elsewhere (web portal). Defendant Mueller Attorneys completely failed to disclose the Newport Beach water district and the $8,150,000 contract. It can be assumed that Mueller would use the same procedure, i.e., Purchase, Installation and Maintenance Agreement, with other sites that Mueller had not disclosed, including Calaveras County, California; Santa Rosa County, Florida; Dayton Beach, Florida; West Slope, Oregon, and any other nondisclosed sites.**

**Furthermore, Defendant Mueller provides instructions on how to install their water meters and how to connect to the cellular or LoRa network. (See Exhibits B and C)**

**Mueller's Installed Water Meter**

**4) CLAIM 48**

Mr. Paradiso's Opinion:

*54. It is my opinion that the Cellular Combination does not infringe because the Accused Products (with a Cellular or LoRaWAN Node) do not include mesh or peer-to-peer technology circuitry that can communicate with at least one of another water meter collection nodes and communication hubs. A 420RDM (with Cellular Node) can wirelessly communicate only with a cell phone tower and a 420 RDM (with LoRaWAN Node) can communicate only with a third-party LoRaWAN gateway. Neither the cellular tower nor the third-party LoRaWAN gateway incorporate mesh or peer-to-peer technology.*

*56. Further, Rein Tech's contentions fail to establish that this element is met because the contentions rely solely on mesh technology of Mi.Mesh, which I understand to be incompatible with Cellular and LoRaWAN Nodes. Accordingly, these contentions do not demonstrate that the Accused Products meet these limitations.*

**Response:**

**Paradiso continues to ignore the claims defined in the Certificate of Correction. Claim 48 reads, "A water meter and leak detection system as recited in claim 45, wherein the base station includes at least one of a mesh or a peer-to-peer technology circuitry that communicates with a one or more base stations or the one or more communication hubs."**

**Dependent Claim 45 introduces the claim language of using a communication hub which is equivalent to the Mi.NET and Mi.NET repeaters, Mi.Node Owl, Mi.Node AC Repeater, and Mi.Node DC repeater (Exhibit H).**

**The '837 Claim Chart provided to the Defendant incorporates the Certificate of Correction claim language. The Mueller 420 RDM and SSM with Mi.Net® LW Meter Interface and Cellular Node Meter Interface with Mi.Net®, one of collection nodes are**

**capable of including at least one of a mesh and/or and peer-to-peer technology circuitry that can communicate with at least one of another water meter collection nodes and communication hubs, "This document specifies the Mi.Mesh protocol stack. This document details the precise mechanisms and message formats used to convey data reliably between two devices equipped with the radio modules. Flow diagrams, message format definitions, and transaction examples give a complete definition of the protocol as it appears over the air and in system memory." and "The Mi.Mesh protocol stack is a frequency-hopping protocol that is designed to permit reliable data delivery between any two nodes. The stack is divided into 4 layers, roughly corresponding to the open systems interconnect model. Layer 1, the physical level, is the 900 MHz spread spectrum radio and driver module responsible for over-the-air transmission and reception of data. Layer 2, the link level, is responsible for reliable point-to-point communications between any pair of directly connected nodes. Layer 3, the network level, provides networking functions including routing, message forwarding, and security. Layer 4, the application services level, is responsible for implementing the client and server processes that provide the basic mesh functions that MiNode applications require, including uploading data, priority message delivery, and device command and control." (Exhibit 15 at MUE000000038-MUE000000051 and Exhibit 20 at MUE000000073- MUE000000076 in Klicpera's Expert Witness Report).**

**It has been shown that using the peer-to-peer network model, a mode of communication typically seen in cellular wireless networks, can result in performance improvements such as increased data rate, reduced transmission power, better load balancing, and enhanced network coverage.**

**Plaintiff has evidence that Mueller was responsible for installing, testing, and maintaining the corporate network per their agreement with Newport Beach, California (Exhibits B and C). Mueller trained utility workers to use the corporate network that Muller installed. These activities were contracted per a major (single) sale agreement between Defendant Mueller and the City of Newport Beach, California.**

**Plaintiff provided evidence that Mueller is responsible for installing the Cellular Combination (refer to Exhibit A, which contains exhibit pages from Klicpera's Expert Witness Report). Plaintiff's Research Attorney discovered the agreement for Mueller water meter installations in Newport Beach, CA beginning in 2023. This exhibit was previously provided to Paradiso, but he apparently ignored it. This exhibited Purchase, Installation and Maintenance Amended Agreement, dated the 25th of May 2023 (after the '837 Patent issue date), was signed by Mueller Systems, LLC Vice President/General Manager Eric Stacey and Assistant Secretary Chason Carroll. This Agreement states that Mueller System, LLC would be paid eight million, one hundred and fifty thousand dollars ("8,150,000.00"). Contractor Mueller would be required for all Work performed in accordance with this Agreement including all reimbursable items, subcontractor fees, for the base contract amount. Hence, while Mueller states that they did not install the infringing water meters, they were paid for such and were responsible for the plumbing installers or contractors and work. Mueller most likely installed their network system and developed the software for the Sentryx API for communicating with Amazon Web Services ("AWS"). Defendant Mueller maintains water data databases at the AWS and network operation center in Atlanta and likely elsewhere (web portal).**

**The Mueller 420 RDM and SSM with Mi.Net® LW Meter Interface and Cellular Node Meter Interface with Mi.Net®, one of collection nodes are capable of including at**

**least one of a mesh and/or and peer-to-peer technology circuitry that can communicate with at least one of another water meter collection nodes and communication hubs. Defendant Mueller stated that "This document specifies the Mi.Mesh protocol stack. This document details the precise mechanisms and message formats used to convey data reliably between two devices equipped with the radio modules. Flow diagrams, message format definitions, and transaction examples give a complete definition of the protocol as it appears over the air and in system memory." and "The Mi.Mesh protocol stack is a frequency-hopping protocol that is designed to permit reliable data delivery between any two nodes. The stack is divided into 4 layers, roughly corresponding to the open systems interconnect model. Layer 1, the physical level, is the 900 MHz spread spectrum radio and driver module responsible for over-the-air transmission and reception of data. Layer 2, the link level, is responsible for reliable point-to-point communications between any pair of directly connected nodes. Layer 3, the network level, provides networking functions including routing, message forwarding, and security. Layer 4, the application services level, is responsible for implementing the client and server processes that provide the basic mesh functions that MiNode applications require, including uploading data, priority message delivery, and device command and control." (Exhibit 15 at MUE000000038-MUE000000051 and Exhibit 20 at MUE000000073- MUE000000076 in Klicpera's Expert Witness Report).**

Mr. Paradiso's Opinion:

*55. Notably, independent claim 42 does not include "collection nodes," or "communication hubs," and Rein Tech's identification of Accused Products does not include any type of collection node or communication hub. Accordingly, Mueller does not directly infringe this claim because*

*the Accused Products do not include these elements and are not made, sold, offered for sale or imported by Mueller with a "collection node" or a communication hub.*

**Response:**

**Paradiso continues to ignore the claims defined in the Certificate of Correction. Claim 49 reads, "A water meter and leak detection system as recited in claim 45, wherein the one or more communication hubs includes at least one of a mesh or a peer-to-peer technology circuitry that communicates with a one or more base stations."**

**Dependent Claim 45 introduces the one or more communication hubs which is equivalent to the Mi.NET and Mi.NET repeaters, Mi.Node Owl, Mi.Node AC repeater, and Mi.Node DC repeater (Exhibit H). Paradiso's understanding is incorrect. The communication hubs primary extends the range of the wireless communication technology and further, if needed, can perform mesh technology with one or more water meters.**

**5) CLAIM 49**

Mr. Paradiso's Opinion:

*57. In my opinion, Claim 49 is not infringed by the Accused Products for substantially the same reasons discussed with respect to Claim 48.*

*58. The Accused Products (with a Cellular or LoRaWAN Node) do not include mesh or peer-to-peer technology circuitry that can communicate with at least one of another water meter collection nodes and communication hubs. A 420RDM (with Cellular Node) can wirelessly communicate only with a cell phone tower and a 420 RDM (with LoRaWAN Node) can communicate only with a third-party LoRaWAN gateway. Neither the cellular tower nor the third party LoRaWAN gateway incorporate mesh or peer-to-peer technology.*

**Response:**

**The '837 Claim Chart provided to the Defendant incorporates the Certificate of Correction claim language. Claim 49 reads, "A water meter and leak detection system as recited in claim 45, wherein the one or more communication hubs includes at least one of a mesh or a peer-to-peer technology circuitry that communicates with a one or more base stations."**

**The Mueller 420 RDM and SSM with Mi.Net® LW Meter Interface and Cellular Node Meter Interface with Mi.Net®, one of collection nodes, are capable of including at least one of a mesh and/or and peer-to-peer technology circuitry that can communicate with at least one of another water meter collection nodes and communication hubs. Defendant Mueller stated that "This document specifies the Mi.Mesh protocol stack. This document details the precise mechanisms and message formats used to convey data reliably between two devices equipped with the radio modules. Flow diagrams, message format definitions, and transaction examples give a complete definition of the protocol as it appears over the air and in system memory." and "The Mi.Mesh protocol stack is a frequency-hopping protocol that is designed to permit reliable data delivery between any two nodes. The stack is divided into 4 layers, roughly corresponding to the open systems interconnect model. Layer 1, the physical level, is the 900 MHz spread spectrum radio and driver module responsible for over-the-air transmission and reception of data. Layer 2, the link level, is responsible for reliable point-to-point communications between any pair of directly connected nodes. Layer 3, the network level, provides networking functions including routing, message forwarding, and security. Layer 4, the application services level, is responsible for implementing the client and server processes that provide the basic mesh functions that MiNode applications require, including uploading data, priority message delivery, and device command and control." (Exhibit 15 at MUE000000038-**

**MUE000000051 and Exhibit 20 at (MUE000000073- MUE000000076 in Klicpera's Expert Witness Report).**

**Dependent Claim 45 introduces the one or more communication hubs which is equivalent to the Mi.NET and Mi.NET repeaters, Mi.Node Owl, Mi.Node AC repeater, and Mi.Node DC repeater (Exhibit H).**

**It has been shown that using the peer-to-peer network model, a mode of communication typically seen in cellular wireless networks, can result in performance improvements such as increased data rate, reduced transmission power, better load balancing, and enhanced network coverage.**

**Plaintiff has evidence that Mueller was responsible for installing, testing, and maintaining the corporate network per their agreement with Newport Beach, California (Exhibits B and C). Mueller trained utility workers to use the corporate network that Muller installed. These activities were contracted per a major (single) sale agreement between Defendant Mueller and the City of Newport Beach, California.**

**Plaintiff provided evidence that Mueller is responsible for installing the Cellular Combination (refer to Exhibit A, which contains exhibit pages from Klicpera's Expert Witness Report). Plaintiff's Research Attorney discovered the agreement for Mueller water meter installations in Newport Beach, CA beginning in 2023. This exhibit was previously provided to Paradiso, but he apparently ignored it. This exhibited Purchase, Installation and Maintenance Amended Agreement, dated the 25th of May 2023 (after the '837 Patent issue date), was signed by Mueller Systems, LLC Vice President/General Manager Eric Stacey and Assistant Secretary Chason Carroll. This Agreement states that Mueller System, LLC would be paid eight million, one hundred and fifty thousand dollars ("8,150,000.00"). Contractor Mueller would be required for all Work performed in**

**accordance with this Agreement including all reimbursable items, subcontractor fees, for the base contract amount. Hence, while Mueller states that they did not install the infringing water meters, they were paid for such and were responsible for the plumbing installers or contractors and work. Mueller most likely installed their network system and developed the software for the Sentryx API for communicating with Amazon Web Services ("AWS"). Defendant Mueller maintains water data databases at the AWS and network operation center in Atlanta and likely elsewhere (web portal).**

Mr. Paradiso's Opinion:

59. *Notably, independent claim 42 does not include "collection nodes," or "communication hubs," and Rein Tech's identification of Accused Products does not include any type of collection node or communication hub. Accordingly, Mueller does not directly infringe this claim because the Accused Products do not include these elements and are not made, sold, offered for sale or imported by Mueller with a "collection node" or a communication hub.*

60. Further, Rein Tech's contentions fail to establish that this element is met because the contentions rely solely on mesh technology of Mi.Mesh, which I understand to be incompatible with Cellular and LoRaWAN Nodes. Accordingly, these contentions do not demonstrate that Accused Products meet these limitations.

**Response:**

**Paradiso continues to ignore the claims defined in the Certificate of Correction. Claim 49 reads, "A water meter and leak detection system as recited in claim 45, wherein the one or more communication hubs includes at least one of a mesh or a peer-to-peer technology circuitry that communicates with a one or more base stations."**

**Dependent Claim 45 introduces the one or more communication hubs which is equivalent to the Mi.NET and Mi.NET repeaters, Mi.Node Owl, Mi.Node AC repeater, and Mi.Node DC repeater (Exhibit H). Paradiso's understanding is incorrect. The communication hubs primary extends the range of the wireless communication technology and further, if needed, can perform mesh technology with one or more water meters.**

**D. The LoRaWAN Combination Does Infringe the Asserted Claims.**

**1) CLAIM 42**

Mr. Paradiso's Opinion:

*61. As demonstrated in detail below, the LoRaWAN Combination does not include each of the limitations of independent claim 42.*

*62. The LoRaWAN Combination does not directly infringe the claim because Rein Tech identified the accused combination as including only the "Mueller 420RDM (Remote Disconnect Meter) with Mi.Net® LoRaWAN (LW) Meter Interface Unit (Node)," but not any structure or feature corresponding to the "water line" or the "water supply," which are both required elements of the claim. In other words, the water shut-off valve of the LoRaWAN Combination is not "interposed between a main water supply line and a water supply for a building or structure" when the LoRaWAN Combination is made, sold, offered for sale, or imported by Mueller. Such can occur (if at all) only after installation of the Accused Product. Rein Tech's contentions focus only on the structure of the LoRaWAN Combination and do not provide any indication or cite any evidence that Mueller is responsible for installing the LoRaWAN Combination nor using the completed system.*

**Response:**

**Paradiso continues to ignore the Certificate of Correction using the pre-CofC claim language which is presented with strikeout applied. The CofC claim is presented in bold.**

~~*a base station having a water control mechanism interposed between a main water supply line and a water supply for a building or structure*~~

**a base station having a water control valve mechanism interposed between a main water source and a water supply line for a building or a structure;**

**Paradiso's statement that the LoRaWAN Combination does not directly infringe the claim is incorrect. Paradiso use of the terms "water line" and "water supply" is incorrect.**

**Plaintiff provided evidence that Mueller is responsible for installing the LoRa Combination (refer to Exhibit A, which contains exhibit pages from Klicpera's Expert Witness Report). Plaintiff's Research Attorney discovered the agreement for Mueller water meter installations in Newport Beach, CA beginning in 2023. This exhibit was previously provided to Paradiso but he apparently ignored it. This exhibited Purchase, Installation and Maintenance Amended Agreement, dated the 25th of May 2023 (after the '837 Patent issue date), was signed by Mueller Systems, LLC Vice President/General Manager Eric Stacey and Assistant Secretary Chason Carroll. This Agreement states that Mueller System, LLC would be paid eight million, one hundred and fifty thousand dollars ("8,150,000.00"). Contractor Mueller would be required for all Work performed in accordance with this Agreement including all reimbursable items, subcontractor fees, for the base contract amount. Hence, while Mueller states that they did not install the infringing water meters, they were paid for such and were responsible for the plumbing installers or contractors and work. Mueller most likely installed their network system and developed the software for the Sentryx API for communicating with Amazon Web Services**

**("AWS"). Defendant Mueller maintains water data databases at the AWS and network operation center in Atlanta and likely elsewhere (web portal). Defendant Mueller Attorneys completely failed to disclose the Newport Beach water district and the $8,150,000 contract. It can be assumed that Mueller would use the same procedure, i.e., Purchase, Installation and Maintenance Agreement, with other sites that Mueller had not disclosed, including Calaveras County, California; Santa Rosa County, Florida; Dayton Beach, Florida; West Slope, Oregon, and any other nondisclosed sites.**

**Furthermore, Defendant Mueller provides instructions on how to install their water meters and how to connect to the cellular or LoRa network. (See Exhibits B and C)**

**Mueller's Installed Water Meter**

Mr. Paradiso's Opinion:

***63.*** *In my opinion, Mueller does not directly infringe the claim because Rein Tech's contentions fail to establish that the limitation of "at least one of a CPU, microprocessor, and microcontroller" is met. Rein Tech's contentions identify the "coated electronic board" of a LoRaWan Node as the alleged "electrical circuitry" but fail to identify any component corresponding to "a CPU, microprocessor and microcontroller with a power source." Instead, Rein Tech's contentions allege only that "one skilled in the art would understand that a CPU,*

*microprocessor with software instructions would be necessary to provide the functions of the water meter, such as organizing the recording and transmitting of water data to a remote source, remotely turning the water control valve on and off, etc." This allegation fails to specify precisely what component(s) of the Accused Product are alleged to constitute the CPU, microprocessor or microcontroller, nor would a POSA understand from these contentions which component(s) of the Accused Product allegedly correspond to the claimed CPU, microprocessor or microcontroller.*

**Response:**

**Paradiso continues to ignore the Certificate of Correction using the pre-CofC claim language which is presented with strikeout applied. The CofC claim is presented in bold.**

~~said base station further comprising; a) electrical circuitry including at least one of a CPU, microprocessor and microcontroller with a power source;~~

**an electrical circuitry including at least one of a CPU, a microprocessor, or a microcontroller, or any combination thereof;**

**Paradiso ignores that Mueller attorneys, during the discovery period, did not provide responsible or reasonable responses to the Rein Tech interrogatories (See Exhibit D), and did not provide production of documents or actual products as requested. These deficiencies were presented in the Klicpera's Expert Witness Report. Conversely, the Rein Tech sent Mueller's attorneys Rein Tech team emails, engineering drawings, pages from discovery documents, file histories, and two base stations (water meters) with communication hubs from its residential field study.**

**Mueller's LoRA Node, mounted on its water meter, has electrical communication with the water meter electrical circuitry to transfer water data using cellular wireless**

**technology. The Plaintiff had to make an assumption regarding the "coated electronic board" from the perspective of a POSITA.**

**A POSITA would clearly understand that the coated electronic board would constitute where the CPU, microprocessor or microcontroller would be located.**

Mr. Paradiso's Opinion:

*64. In my opinion, the LoRaWAN Combination does not include this limitation for several reasons.*

*65. First, the LoRaWAN Combination does not include "one or more flow rate sensors." According to the Court's Claim Construction Order (D.I. 151), the limitation of "flow rate sensor" in independent claim 42 is construed as "[a] device that measures the rate of a flow of water." (D.I. 151, p. 1). Unlike some meters, such as ultrasonic meters, that directly measure fluid flow rate, it is my understanding from conversations with Mueller Systems employees that the nutating disk meter is a positive displacement meter, where each revolution of the internal measuring element denotes a certain volume of water that has passed through the meter. Revolutions of the disk are counted by the register via a mechanical magnetic coupling or an electrical pickup. The nutating disk meter does not measure flow rate (volume/time); therefore, this limitation is not met by the LoRaWAN Combination, in my opinion.*

**Response:**

**Paradiso continues to ignore the Certificate of Correction using the pre-CofC claim language which is presented with strikeout applied. The CofC claim is presented in bold.**

~~one or more flow rate sensor connected to the main water supply and connected to said electrical circuitry and designed to monitor at least one of a water use data, water energy use data, water quality data and leak detection information from said building or~~

~~structure, said one or more flow rate sensors connected to the main water supply and connected with said electrical circuitry;~~

**one or more flow rate sensors connected to the water supply line and designed to monitor at least one of a water use data, a water energy use data, a water quality data, or a leak detection information, or any combination thereof, from the building or the structure, the one or more flow rate sensors connected with the electrical circuitry;**

**A POSITA would consider that a nutating disc includes a meter register that measures water flow over a period of time and, thus, the nutating disc is a flow rate sensor. Nutating disc flow meters are one of the most common types of positive displacement flow meters. They operate by having a disc mounted to a central ball. Water enters a precision machined chamber containing a disc that nutates (wobbles). The position of the disc divides the chamber into compartments containing an exact volume. Liquid pressure drives the disc to wobble and a roller cam causes the nutating disc to make a complete cycle. The movements of the disc are transmitted to an indicator/totalizer or pulse transmitter. When fluid enters the chamber, it causes the disc to wobble (nutate), transferring the displaced volume to the register. So, as an example, if the total volume data is recorded and transmitted every 15 minutes, then large and slow flows of water can be shown and compared every 15 minutes to determine if a leak occurs at a location, monitoring water use over time. If the nutating disc was not measuring water use over time, then what function does the nutating disc have?**

**Even if the Defendant were successful in claiming the nutating disc is not a flow rate sensor, then the defendant is still infringing under the Doctrine of Equivalents per MPEP**

**2186 Relationship to the Doctrine of Equivalents [R-07.2022]. The Doctrine of Equivalents arises in the context of an infringement action. If an accused product or process does not literally infringe a patented invention, the accused product or process may be found to infringe under the Doctrine of Equivalents. The essential objective inquiry is: "Does the accused product or process contain elements identical or equivalent to each claimed element of the patented invention?"** ***Warner-Jenkinson Co. v. Hilton Davis Chemical Co.*****, 520 U.S. 17, 40, 41 USPQ2d 1865, 1875 (1997). In determining equivalence, "[a]n analysis of the role played by each element in the context of the specific patent claim will thus inform the inquiry as to whether a substitute element matches the function, way, and result of the claimed element, or whether the substitute plays a role substantially different from the claimed element." 520 U.S. at 40, 41 USPQ2d at 1875. Both a flow rate sensor and a nutating disc measure water consumption over time at a residence or corporation.**

Mr. Paradiso's Opinion:

*66. Second, this limitation requires "one or more . . . sensors connected to the main water supply." As similarly discussed above in Subsection VII.ii.a.1., the nutating disc identified as the alleged flow rate sensor of the LoRaWAN Combination is not connected to a main water supply when the Accused Product is made, sold, offered for sale, or imported by Mueller. Such can occur (if at all) only after installation and during use of the Accused Product by a customer. Rein Tech's contentions do not provide any indication or cite any evidence that Mueller is responsible for installing the LoRaWAN Combination nor using the completed system after installation.*

**Response:**

**Plaintiff provided evidence that Mueller is responsible for installing the LoRa Combination (refer to Exhibit A, which contains exhibit pages from Klicpera's Expert Witness Report). Plaintiff's Research Attorney discovered the agreement for Mueller water meter installations in Newport Beach, CA beginning in 2023. This exhibit was previously provided to Paradiso, but he apparently ignored it. This exhibited Purchase, Installation and Maintenance Amended Agreement, dated the 25th of May 2023 (after the '837 Patent issue date), was signed by Mueller Systems, LLC Vice President/General Manager Eric Stacey and Assistant Secretary Chason Carroll. This Agreement states that Mueller System, LLC would be paid eight million, one hundred and fifty thousand dollars ("8,150,000.00"). Contractor Mueller would be required for all Work performed in accordance with this Agreement including all reimbursable items, subcontractor fees, for the base contract amount. Hence, while Mueller states that they did not install the infringing water meters, they were paid for such and were responsible for the plumbing installers or contractors and work. Mueller most likely installed their network system and developed the software for the Sentryx API for communicating with Amazon Web Services ("AWS"). Defendant Mueller maintains water data databases at the AWS and network operation center in Atlanta and likely elsewhere (web portal). Defendant Mueller Attorneys completely failed to disclose the Newport Beach water district and the $8,150,000 contract. It can be assumed that Mueller would use the same procedure, i.e., Purchase, Installation and Maintenance Agreement, with other sites that Mueller had not disclosed, including Calaveras County, California; Santa Rosa County, Florida; Dayton Beach, Florida; West Slope, Oregon, and any other nondisclosed sites.**

**Furthermore, Defendant Mueller provides instructions on how to install their water meters and how to connect to the cellular or LoRa network. (See Exhibits B and C)**

**Mueller's Installed Water Meter**

Mr. Paradiso's Opinion:

*67. Third, the nutating disc sensor identified by Rein Tech in its contentions is not electrically connected to the "coated electronic board" identified by Rein Tech as corresponding to the "electrical circuitry" limitation, nor any other electrical structure. Instead, the nutating disc sensor is coupled magnetically to electronics within the register. Therefore, this limitation is not met by the LoRaWAN Combination.*

**Response:**

**Paradiso ignores that Mueller attorneys, during the discovery period, did not provide responsible or reasonable responses to the Rein Tech interrogatories (See Exhibit D), and did not provide production of documents or actual products as requested. These deficiencies were presented in the Klicpera's Expert Witness Report. Conversely, Rein Tech sent Mueller's attorneys Rein Tech team emails, engineering drawings, pages from discovery documents, file histories, and two base stations (water meters) with communication hubs from its residential field study.**

**Paradiso stated that "the nutating disc sensor is coupled magnetically to <u>electronics within the register</u>." However, the Mueller representative informed Rein Tech that Mueller has two registers, the Mueller Encoder Eight (ME-8) and the Solid State Register (SSR)**

**registers. Attached in Exhibit E and F are copies of Mueller's publications for the ME-8 register and the SSR register, respectively. The ME-8 provides 8 digits of electronic resolution that is interrogated by a Mueller Systems AMR/AMI device, the Mueller Encoder ME-8 register communicates the unique ten-digit serial number and up to an eight-digit electronic reading in ACSII format where it can be recorded and maintained within the reporting structure of the AMR/AMI system. The SSR register provides up to 10 digits of visual resolution and up to 9 digits of electronic resolution for "outstanding" granularity when used in conjunction with Mueller Systems AMR and AMI systems. Granularity of data and frictionless operation permit customers to capture maximum revenue and be proactive in leak detection and resource conservation. (underlining added)**

**Even if the Defendant were successful in claiming their nutating disc sensor is coupled magnetically to electronics within the ME-8 and SSR registers, then the defendant is still infringing under the Doctrine of Equivalents per MPEP 2186 Relationship to the Doctrine of Equivalents [R-07.2022]. The Doctrine of Equivalents arises in the context of an infringement action. If an accused product or process does not literally infringe a patented invention, the accused product or process may be found to infringe under the Doctrine of Equivalents. The essential objective inquiry is: "Does the accused product or process contain elements identical or equivalent to each claimed element of the patented invention?" *Warner-Jenkinson Co. v. Hilton Davis Chemical Co.,* 520 U.S. 17, 40, 41 USPQ2d 1865, 1875 (1997). In determining equivalence, "[a]n analysis of the role played by each element in the context of the specific patent claim will thus inform the inquiry as to whether a substitute element matches the function, way, and result of the claimed element, or whether the substitute plays a role substantially different from the claimed element." 520 U.S. at 40, 41 USPQ2d at 1875. Even if Mueller's nutating disc sensor is coupled**

**magnetically to electronics within the ME-8 and SSR registers, both a flow rate sensor and a nutating disc measure water consumption over time at a residence or corporation. Also, both Mueller's ME-8 and SSR communicate with the cellular node and LoRa node and, therefore, a CPU, microprocessor or microcontroller communicates to operate the pilot control valve and coordinates of the wireless transmissions.**

Mr. Paradiso's Opinion:

*68. In my opinion, Mueller does not directly infringe Claim 42 because the wireless communication technology of the LoRaWAN Combination does not "utilize[] authentication and encryption technologies" when the LoRaWAN Combination is made, sold, offered for sale or imported by Mueller. Such can occur (if at all) only after installation and during use of the Accused Product by a customer. Rein Tech's contentions do not provide any indication or cite any evidence that Mueller is responsible for installing the LoRaWAN Combination nor using the completed system after installation.*

**Response:**

**Paradiso continues to ignore the Certificate of Correction using the pre-CofC claim language which is presented with strikeout applied. The CofC claim is presented in bold.**

~~wherein said one or more wireless communication technologies utilizes authentication and encryption technologies for pairing operations and to prevent unauthorized access to the water data or information; and~~

**wherein the one or more wireless communication technologies utilizes authentication and encryption technologies for pairing operations and to prevent unauthorized access to a water data or information; and**

**The '837 Claim Chart provided to the Defendant incorporates the Certificate of Correction claim language. Mueller's water meters utilize authentication and encryption technologies for pairing operations and to prevent unauthorized access to the water data or information. Per Mueller, "Security, LoRaWAN employs two layers of strict security measures. With network security, it ensures authenticity of the node in the network, while the application layer of the security ensures the network operator does not have access to the end user's application data" (Exhibit 2, page 3 of Klicpera's Expert Witness Report) and "Security LoRaWAN by design is very secure – authentication and encryption are, in fact, mandatory" (Exhibit 3, page 1 of Klicpera's Expert Witness Report). Also per Mueller, "With two session keys, the Network Session Key (NwkSKey) and Application key (APPSKey) to prevent spoofing and eavesdropping" (Exhibit 17 at Bates No. MUE00000069-MUE000000072 and Exhibit 19 at Bates No. MUE000000078 in Klicpera's Expert Witness Report).**

**Encryption and Authentication is critical and implied by the security of the water meter and wireless transmissions. Mueller has implemented security measures to provide data protection on the user interface, critical field devices, and utility IT data systems. Amazon Web Service (AWS) provides an added level of protection of the utility, homeowner and business data. If a command signal is sent by the operations center that a leak has been detected as a particular residence, some form an authentication is necessary that the command signal only turns off the desired water meter. (Exhibit 2, page 3 in Klicpera's Expert Witness Report).**

**The '837 Claim Chart provided to the Defendant incorporates the Certificate of Correction claim language. Per Mueller, "Security, LoRaWAN employs two layers of strict security measures. With network security, it ensures authenticity of the node in the**

**network, while the application layer of the security ensures the network operator does not have access to the end user's application data" (Exhibit 3, page 1 in Klicpera's Expert Witness Report) and "Security LoRaWAN by design is very secure – authentication and encryption are, in fact, mandatory. With two session keys, the Network Session Key (NwkSKey) and Application key (APPSKey) to prevent spoofing and eavesdropping" (Exhibit 17 at Bates No. MUE00000069-MUE000000 in Klicpera's Expert Witness Report).**

**Furthermore, shown in Exhibits G is the mobileRDM (a phone app and device) that shows the signal strength, presets, battery voltage, and firmware version of a particular water meter that has been paired and authenticated.**

**Exhibits G and J display a mobileRDM that demonstrates a cell phone with a Meuller water APP to remotely connect or disconnect water services using a two-way radio. While a user or a corporate car is within 1000 feet a service connection, selecting a function on the Mueller water APP a signal is transferred to the Mueller water meter. The water meter 25-30 second process (pairing the mobileRDM) confirms that the user signal has been sent. Once connected with the mobileRDM application, water service can be connected or disconnected. The mobileRDM application confirms to the user when the process is complete. One of the phone settings is the Reset (or Preset) button.**

**A POSITA would understand the information discussed above and would conclude that authentication and encryption are utilized by the Mueller water meter with LoRa node.**

**Plaintiff provided evidence that Mueller is responsible for installing the LoRa Combination (refer to Exhibit A, which contains exhibit pages from Klicpera's Expert Witness Report). Plaintiff's Research Attorney discovered the agreement for Mueller water meter installations in Newport Beach, CA beginning in 2023. This exhibit was**

**previously provided to Paradiso but he apparently ignored it. This exhibited Purchase, Installation and Maintenance Amended Agreement, dated the 25th of May 2023 (after the '837 Patent issue date), was signed by Mueller Systems, LLC Vice President/General Manager Eric Stacey and Assistant Secretary Chason Carroll. This Agreement states that Mueller System, LLC would be paid eight million, one hundred and fifty thousand dollars ("8,150,000.00"). Contractor Mueller would be required for all Work performed in accordance with this Agreement including all reimbursable items, subcontractor fees, for the base contract amount. Hence, while Mueller states that they did not install the infringing water meters, they were paid for such and were responsible for the plumbing installers or contractors and work. Mueller most likely installed their network system and developed the software for the Sentryx API for communicating with Amazon Web Services ("AWS"). Defendant Mueller maintains water data databases at the AWS and network operation center in Atlanta and likely elsewhere (web portal). Defendant Mueller Attorneys completely failed to disclose the Newport Beach water district and the $8,150,000 contract. It can be assumed that Mueller would use the same procedure, i.e., Purchase, Installation and Maintenance Agreement, with other sites that Mueller had not disclosed, including Calaveras County, California; Santa Rosa County, Florida; Dayton Beach, Florida; West Slope, Oregon, and any other nondisclosed sites.**

**Furthermore, Defendant Mueller provides instructions on how to install their water meters and how to connect to the cellular or LoRa network. (See Exhibits B and C)**

**Mueller's Installed Water Meter**

Mr. Paradiso's Opinion:

***69.*** *Additionally, the LoRaWAN Combination does not include this limitation because the 420RDM with Cellular Node does not use authentication and encryption technologies for pairing operations as required by this limitation. 5 See, e.g., MUE000000002.*

**Response:**

**The '837 Claim Chart provided to the Defendant incorporates the Certificate of Correction claim language. Mueller's water meters utilize authentication and encryption technologies for pairing operations and to prevent unauthorized access to the water data or information. Per Mueller, "Security, LoRaWAN employs two layers of strict security measures. With network security, it ensures authenticity of the node in the network, while the application layer of the security ensures the network operator does not have access to the end user's application data" (Exhibit 2, page 3 of Klicpera's Expert Witness Report) and "Security LoRaWAN by design is very secure – authentication and encryption are, in fact, mandatory" (Exhibit 3, page 1 of Klicpera's Expert Witness Report). Also per Mueller, "With two session keys, the Network Session Key (NwkSKey) and Application key (APPSKey) to prevent spoofing and eavesdropping" (Exhibit 17 at Bates No.**

**MUE00000069-MUE000000072 and Exhibit 19 at Bates No. MUE000000078 in Klicpera's Expert Witness Report).**

**Encryption and Authentication is critical and implied by the security of the water meter and wireless transmissions. Mueller has implemented security measures to provide data protection on the user interface, critical field devices, and utility IT data systems. Amazon Web Service (AWS) provides an added level of protection of the utility, homeowner and business data. If a command signal is sent by the operations center that a leak has been detected as a particular residence, some form an authentication is necessary that the command signal only turns off the desired water meter. (Exhibit 2, page 3 in Klicpera's Expert Witness Report).**

**The '837 Claim Chart provided to the Defendant incorporates the Certificate of Correction claim language. Per Mueller, "Security, LoRaWAN employs two layers of strict security measures. With network security, it ensures authenticity of the node in the network, while the application layer of the security ensures the network operator does not have access to the end user's application data" (Exhibit 3, page 1 in Klicpera's Expert Witness Report) and "Security LoRaWAN by design is very secure – authentication and encryption are, in fact, mandatory. With two session keys, the Network Session Key (NwkSKey) and Application key (APPSKey) to prevent spoofing and eavesdropping" (Exhibit 17 at Bates No. MUE00000069-MUE000000 in Klicpera's Expert Witness Report).**

**Furthermore, shown in Exhibit G is the mobileRDM (a phone app and device) that shows the signal strength, presets, battery voltage, and firmware version of a particular water meter that has been paired and authenticated.**

**Exhibits G and J display a mobileRDM that demonstrates a cell phone with a Meuller water APP to remotely connect or disconnect water services using a two-way radio.**

**While a user or a corporate car is within 1000 feet a service connection, selecting a function on the Mueller water APP a signal is transferred to the Mueller water meter. The water meter 25-30 second process (pairing the mobileRDM) confirms that the user signal has been sent. Once connected with the mobileRDM application, water service can be connected or disconnected. The mobileRDM application confirms to the user when the process is complete. One of the phone settings is the Reset (or Preset) button.**

**A POSITA would conclude that the Mueller water meter utilizes authentication and encryption technologies for pairing operations and to prevent unauthorized access to water data or information.**

Mr. Paradiso's Opinion:

*70. As noted in my opening report on invalidity, this limitation is indefinite. As best understood, the recitation of "long-range LoRa, Sigfox, UNB, NB-IoT, 6LoWPAN, WiMAX, cellular technology 3GPP and LTE-M and 5G" refers back to the recitation of "at least one of a LoRa, Sigfox, Ultra Narrow Band 6LowPAN, NB-IoT, LTE-M cellular, and 5G cellular technology" in element d). The "at least one of a LoRa, Sigfox, Ultra Narrow Band 6LowPAN, NB-IoT, LTE-M cellular, and 5G cellular technology" of element d) are comprised by the "one or more wireless communication technologies" of element d), which in turn are comprised by the base station. See Claim 42 ("said base station further comprising . . . d) one or more wireless communication technologies comprising at least one of a LoRa, Sigfox, Ultra Narrow Band 6LowPAN, NB-IoT, LTE-M cellular, and 5G cellular technology"). The alleged one or more wireless communication technologies of the alleged base station neither "receive at least one of a water use data, water energy use data, water quality data and leak detection information" nor "send commands to regulate the control valve mechanism." Instead, the 420RDM with*

*LoRaWAN Node sends meter readings and receives remote commands to operate its valve mechanism.*

**Response:**

**Paradiso continues to ignore the Certificate of Correction using the pre-CofC claim language which is presented with strikeout applied. The CofC claim is presented in bold.**

~~wherein the long-range LoRa, Sigfox, UNB, NB-IoT, 6LoWPAN, WiMAX, cellular technology 3GPP and LTE-M and 5G consist of a duplex technology to both receive at least one of a water use data, water energy use data, water quality data and leak detection information and send commands to regulate the control valve mechanism;~~

**wherein the one or more wireless communication technologies comprising at least one of the LoRa, the Sigfox, the Ultra Narrow Band (UNB), the 6LoWPAN, the WiMAX, the NB-IoT, the 3GPP cellular, the 4G/LTE-M cellular, or the 5G cellular technology, or any combination thereof, consists of a duplex technology to transmit the water use data, the water energy use data, the water quality data, or the leak detection information, or any combination thereof, and send commands to regulate the water control valve mechanism;**

**Paradiso continues to ignore the claims defined in the '837 Certificate of Correction, which shows:**

**Claim 42, element d) one or more wireless communication technologies comprising at least one of a LoRa, a Sigfox, an U1tra Narrow Band (UNB), a 6LoWPAN, a WiMAX, a NB-IoT, a 3GPP cellular, a 4G/LTE-M cellular, or a 5G cellular technology, or any combination thereof;**

**Claim 42, element f) wherein the one or more wireless communication technologies comprising at least one of the LoRa, the Sigfox, the Ultra Narrow Band (UNB), the 6LoWPAN, the WiMAX, the NB-IoT, the 3GPP cellular, the 4G/LTE-M cellular, or the 5G cellular technology, or any combination thereof, consists of a duplex technology to transmit the water use data, the water energy use data, the water quality data, or the leak detection information, or any combination thereof, and send commands to regulate the water control valve mechanism;**

**Thus, the '837 Certificate of Correction lists of wireless communication technologies is aligned in Claim 42 elements d and f. Also, Claim 42 states that duplex technology transmits water data and sends (remote) commands to regulate the water control valve mechanism.**

**A POSITA would understand that Claim 42 includes the limitation of "wherein the one or more wireless communication technologies comprising at least one of the LoRa, the Sigfox, the Ultra Narrow Band (UNB), the 6LoWPAN, the WiMAX, the NB-IoT, the 3GPP cellular, the 4G/LTE-M cellular, or the 5G cellular technology, or any combination thereof, consists of a duplex technology to transmit the water use data, the water energy use data, the water quality data, or the leak detection information, or any combination thereof, and send commands to regulate the water control valve mechanism".**

Mr. Paradiso's Opinion:

*71. Accordingly, in my opinion, the LoRaWAN Combination does not satisfy the limitation of* "wherein the long-range LoRa, Sigfox, UNB, NB-IoT, 6LoWPAN, WiMAX, cellular technology 3GPP and LTE-M and 5G consist of a duplex technology to both receive at least one of a water

use data, water energy use data, water quality data and leak detection information and send commands to regulate the control valve mechanism."

**Response:**

**Paradiso continues to ignore the claims defined in the Certificate of Correction. Claim 42, element d recites: one or more wireless communication technologies comprising at least one of a LoRa, a Sigfox, an Ultra Narrow Band (UNB), a 6LoWPAN, a WiMAX, a NB-IoT, a 3GPP cellular, a 4G/LTE-M cellular, or a 5G cellular technology, or any combination thereof;**

**Claim 42, element f recites: wherein the one or more wireless communication technologies comprising at least one of the LoRa, the Sigfox, the Ultra Narrow Band (UNB), the 6LoWPAN, the WiMAX, the NB-IoT, the 3GPP cellular, the 4G/LTE-M cellular, or the 5G cellular technology, or any combination thereof, consists of a duplex technology to transmit the water use data, the water energy use data, the water quality data, or the leak detection information, or any combination thereof, and send commands to regulate the water control valve mechanism;**

Mr. Paradiso's Opinion:

*72. Mueller does not directly infringe Claim 42 because the wireless communication technology of the 420RDM (with Cellular or LoRaWAN Node) does not receive "water use data, water energy use data, water quality data and leak detection information" or "send commands to regulate the control valve mechanism." Water use data is transmitted (not received) by the wireless communication technology of the 420RDM (with Cellular or LoRaWAN Node) and commands are received (not transmitted) by the wireless communication technology of the 420RDM (with Cellular or LoRaWAN Node). Additionally, these limitations can only be met (if*

*at all) when the LoRaWAN Combination is installed and used by a customer; therefore, Mueller cannot directly infringe this claim by selling, offering for sale, making, or importing the Accused Products. Rein Tech's contentions do not provide any indication or cite any evidence that Mueller is responsible for installing the LoRaWAN Combination nor using the completed system after installation.*

**Response:**

**Paradiso continues to ignore the Certificate of Correction using the pre-CofC claim language which is presented with strikeout applied. The CofC claim is presented in bold.**

~~wherein the long-range LoRa, Sigfox, UNB, NB-IoT, 6LoWPAN, WiMAX, cellular technology 3GPP and LTE-M and 5G consist of a duplex technology to both receive at least one of a water use data, water energy use data, water quality data and leak detection information and send commands to regulate the control valve mechanism;~~

**wherein the one or more wireless communication technologies comprising at least one of the LoRa, the Sigfox, the Ultra Narrow Band (UNB), the 6LoWPAN, the WiMAX, the NB-IoT, the 3GPP cellular, the 4G/LTE-M cellular, or the 5G cellular technology, or any combination thereof, consists of a duplex technology to transmit the water use data, the water energy use data, the water quality data, or the leak detection information, or any combination thereof, and send commands to regulate the water control valve mechanism;**

**Paradiso continues to ignore the claims defined in the '837 Certificate of Correction, which shows:**

**Claim 42, element d) one or more wireless communication technologies comprising at least one of a LoRa, a Sigfox, an U1tra Narrow Band (UNB), a 6LoWPAN, a**

**WiMAX, a NB-IoT, a 3GPP cellular, a 4G/LTE-M cellular, or a 5G cellular technology, or any combination thereof;**

**Claim 42, element f) wherein the one or more wireless communication technologies comprising at least one of the LoRa, the Sigfox, the Ultra Narrow Band (UNB), the 6LoWPAN, the WiMAX, the NB-IoT, the 3GPP cellular, the 4G/LTE-M cellular, or the 5G cellular technology, or any combination thereof, consists of a duplex technology to transmit the water use data, the water energy use data, the water quality data, or the leak detection information, or any combination thereof, and send commands to regulate the water control valve mechanism;**

**Thus, the '837 Certificate of Correction lists of wireless communication technologies is aligned in Claim 42 elements d and f. Also, Claim 42 states that duplex technology transmits water data and sends (remote) commands to regulate the water control valve mechanism.**

**A POSITA would understand that Claim 42 includes the limitation of "wherein the one or more wireless communication technologies comprising at least one of the LoRa, the Sigfox, the Ultra Narrow Band (UNB), the 6LoWPAN, the WiMAX, the NB-IoT, the 3GPP cellular, the 4G/LTE-M cellular, or the 5G cellular technology, or any combination thereof, consists of a duplex technology to transmit the water use data, the water energy use data, the water quality data, or the leak detection information, or any combination thereof, and send commands to regulate the water control valve mechanism".**

**Plaintiff provided evidence that Mueller is responsible for installing the LoRa Combination (refer to Exhibit A, which contains exhibit pages from Klicpera's Expert Witness Report). Plaintiff's Research Attorney discovered the agreement for Mueller water meter installations in Newport Beach, CA beginning in 2023. This exhibit was**

**previously provided to Paradiso but he apparently ignored it. This exhibited Purchase, Installation and Maintenance Amended Agreement, dated the 25th of May 2023 (after the '837 Patent issue date), was signed by Mueller Systems, LLC Vice President/General Manager Eric Stacey and Assistant Secretary Chason Carroll. This Agreement states that Mueller System, LLC would be paid eight million, one hundred and fifty thousand dollars ("8,150,000.00"). Contractor Mueller would be required for all Work performed in accordance with this Agreement including all reimbursable items, subcontractor fees, for the base contract amount. Hence, while Mueller states that they did not install the infringing water meters, they were paid for such and were responsible for the plumbing installers or contractors and work. Mueller most likely installed their network system and developed the software for the Sentryx API for communicating with Amazon Web Services ("AWS"). Defendant Mueller maintains water data databases at the AWS and network operation center in Atlanta and likely elsewhere (web portal). Defendant Mueller Attorneys completely failed to disclose the Newport Beach water district and the $8,150,000 contract. It can be assumed that Mueller would use the same procedure, i.e., Purchase, Installation and Maintenance Agreement, with other sites that Mueller had not disclosed, including Calaveras County, California; Santa Rosa County, Florida; Dayton Beach, Florida; West Slope, Oregon, and any other nondisclosed sites.**

**Furthermore, Defendant Mueller provides instructions on how to install their water meters and how to connect to the cellular or LoRa network. (See Exhibits B and C)**

**Mueller's Installed Water Meter**

Mr. Paradiso's Opinion:

*73. The Accused Products do not directly infringe this claim because the Accused Products do not meet this limitation because the wireless communication technology of the 420RDM (with Cellular or LoRaWAN Node) does not receive "water use data, water energy use data, water quality data and leak detection information" or "send commands to regulate the control valve mechanism." Water use data is transmitted (not received) by the wireless communication technology of the 420RDM (with Cellular or LoRaWAN Node) and commands are received (not transmitted) by the wireless communication technology of the 420RDM (with Cellular or LoRaWAN Node).*

**Response:**

**Paradiso continues to ignore the claims defined in the '837 Certificate of Correction, which shows:**

**Claim 42, element d) one or more wireless communication technologies comprising at least one of a LoRa, a Sigfox, an U1tra Narrow Band (UNB), a 6LoWPAN, a WiMAX, a NB-IoT, a 3GPP cellular, a 4G/LTE-M cellular, or a 5G cellular technology, or any combination thereof;**

**Claim 42, element f) wherein the one or more wireless communication technologies comprising at least one of the LoRa, the Sigfox, the Ultra Narrow Band (UNB), the 6LoWPAN, the WiMAX, the NB-IoT, the 3GPP cellular, the 4G/LTE-M cellular, or the 5G cellular technology, or any combination thereof, consists of a duplex technology to transmit the water use data, the water energy use data, the water quality data, or the leak detection information, or any combination thereof, and send commands to regulate the water control valve mechanism;**

**Thus, the '837 Certificate of Correction lists of wireless communication technologies is aligned in Claim 42 elements d and f. Also, Claim 42 states that duplex technology transmits water data and sends (remote) commands to regulate the water control valve mechanism.**

**A POSITA would understand that Claim 42 includes the limitation of "wherein the one or more wireless communication technologies comprising at least one of the LoRa, the Sigfox, the Ultra Narrow Band (UNB), the 6LoWPAN, the WiMAX, the NB-IoT, the 3GPP cellular, the 4G/LTE-M cellular, or the 5G cellular technology, or any combination thereof, consists of a duplex technology to transmit the water use data, the water energy use data, the water quality data, or the leak detection information, or any combination thereof, and send commands to regulate the water control valve mechanism".**

Mr. Paradiso's Opinion:

*74. In my opinion, these limitations are not met by the LoRaWAN Combination for several reasons.*

*75. First, Rein Tech's contentions do not include any support whatsoever for its*

*allegation that the LoRaWAN Combination "include[s] one of a programming setting managed by the user, remotely a mode setting, and a default or restricted setting processed by the manufacturing factory." Accordingly, Rein Tech has not shown that these limitations are met, and a POSA would not understand the LoRaWAN Combination to include these limitations.*

**Response:**

**Paradiso continues to ignore the Certificate of Correction using the pre-CofC claim language which is presented with strikeout applied. The CofC claim is presented in bold.**

~~the CPU, microprocessor or microcontroller can at least include one of a programming setting managed by the user, remotely a mode setting, and a default or restricted setting processed by the manufacturing factory to: a) record the water flow event to a local memory bank or removable memory device for regional or controlled analysis, b) combine a plurality of water low events into a local memory bank and subsequently schedule the transfer of the water flow event dataset to a remote computer or server, or to a cloud service company, c) directly transfer the water .flow event to a remote computer or server, or to a cloud service company, or d) transfer the water flow data utilizing a blockchain format to one or more remote computers or servers, or cloud service company; and,~~

**the CPU, the microprocessor, or the microcontroller, or any combination thereof, includes at least one of a programming setting managed by a user to remotely set a mode setting or modify a default setting processed by a manufacturer to: a) record a water flow event to an integrated memory bank or a removable memory device for analysis; b) combine a plurality of water flow events into the integrated memory bank and subsequently schedule the transfer of the water flow events to a one or more remote computers or servers or to a cloud computing company; c) transfer the water flow event to the one or more remote computers or servers or to the cloud computing**

**company; d) transfer the water data or information utilizing a blockchain technology to the one or more remove computers or servers or to the cloud computing company;**

**The '837 Claim Chart provided to the Defendant incorporates the Certificate of Correction claim language.**

**In regard to Claim 42, element "record a water flow event to an integrated memory bank or a removable memory device for analysis;":**

**The Mueller 420 RDM and SSM with Mi.Net® LW Meter Interface and LoRa Node Meter Interface with Mi.Net® record the water flow event to a local memory bank or removable memory device for analysis; "Information retrieved from a water meter is stored temporarily with the node's non-volatile internal memory", and "Logs and stores 105 days of hourly data meter data in internal memory" (Exhibit 1 at RT009366 in Klicpera's Expert Witness Report); "2MB Solid-state Flash Memory for dedicated storage of readings" and "Configurable data storage" . . . 8-digit electronic reading in ACSII format where it can be recorded and maintained . . ." (Exhibit 11 at MUE000000341 and the SSM water meter in Exhibit 23 at MUE000000148 in Klicpera's Expert Witness Report); "Network Operations Center" (Exhibit 7 at RT009377 and Exhibit 10 at RT009394 in Klicpera's Expert Witness Report).**

**In regard to Claim 42, element "combine a plurality of water flow events into the integrated memory bank and subsequently schedule the transfer of the water flow events to a one or more remote computers or servers or to a cloud computing company;":**

**The Mueller 420 RDM and SSM with Mi.Net® LW Meter Interface and LoRa Node Meter Interface with Mi.Net® "<u>The node transmits water meter data</u> to the LoRaWAN <u>network</u>**

**daily", (Exhibit 2 at RT009368 and Exhibit 16 at Bates No. MUE000000053-MUE000000054 in Klicpera's Expert Witness Report). (underlining added)**

**In regard to Claim 42, element "transfer the water flow event to the one or more remote computers or servers or to the cloud computing company;":**

**The Mueller 420 RDM and SSM with Mi.Net® LW Meter Interface and LoRa Node Meter Interface with Mi.Net®, "Amazon Web Service (AWS) provides an added level of protection of the utility, homeowner and business data" (Exhibit 13 at RT009400 and Exhibit 16 at Bates No. MUE000000053-MUE000000054 in Klicpera's Expert Witness Report). (underlining added)**

Mr. Paradiso's Opinion:

*76. Second, these limitations identify numerous functions a-d, none of which can be performed by the LoRaWAN Combination prior to installation. For example, each requires a "water flow event" and/or "water flow data." Prior to installation, the Accused Products are not in communication with any water source; therefore, there can be no "water flow event" and/or "water flow data." Accordingly, the Accused Products do not infringe at the time the products are sold, offered for sale, imported, or made. Rein Tech's contentions do not provide any indication or cite any evidence that Mueller is responsible for installing the LoRaWAN Combination nor using the completed system after installation.*

**Response:**

**Paradiso continues to disregard the '837 Certificate of Corrections and, thus, his opinions are erroneous. He is unqualified to refute the decisions of the trained and qualified Patent Examiner and Supervisor, and approval by the Director of the USPTO.**

**Plaintiff provided evidence that Mueller is responsible for installing the LoRa Combination (refer to Exhibit A, which contains exhibit pages from Klicpera's Expert Witness Report). Plaintiff's Research Attorney discovered the agreement for Mueller water meter installations in Newport Beach, CA beginning in 2023. This exhibit was previously provided to Paradiso, but he apparently ignored it. This exhibited Purchase, Installation and Maintenance Amended Agreement, dated the 25th of May 2023 (after the '837 Patent issue date), was signed by Mueller Systems, LLC Vice President/General Manager Eric Stacey and Assistant Secretary Chason Carroll. This Agreement states that Mueller System, LLC would be paid eight million, one hundred and fifty thousand dollars ("8,150,000.00"). Contractor Mueller would be required for all Work performed in accordance with this Agreement including all reimbursable items, subcontractor fees, for the base contract amount. Hence, while Mueller states that they did not install the infringing water meters, they were paid for such and were responsible for the plumbing installers or contractors and work. Mueller most likely installed their network system and developed the software for the Sentryx API for communicating with Amazon Web Services ("AWS"). Defendant Mueller maintains water data databases at the AWS and network operation center in Atlanta and likely elsewhere (web portal). Defendant Mueller Attorneys completely failed to disclose the Newport Beach water district and the $8,150,000 contract. It can be assumed that Mueller would use the same procedure, i.e., Purchase, Installation and Maintenance Agreement, with other sites that Mueller had not disclosed, including Calaveras County, California; Santa Rosa County, Florida; Dayton Beach, Florida; West Slope, Oregon, and any other nondisclosed sites.**

**Furthermore, Defendant Mueller provides instructions on how to install their water meters and how to connect to the cellular or LoRa network. (See Exhibits B and C)**

**Mueller's Installed Water Meter**

Mr. Paradiso's Opinion:

*77. In my opinion, Mueller does not directly infringe Claim 42 because the wireless communication technology of the Accused Product is not capable of "transmitting at least one of a 1) water use data, water energy use data, water quality data and leak detection information and, 2) obtains an instruction or signal" when the Accused Product is made, sold, offered for sale or imported by Mueller. Such can occur (if at all) only after installation and during use of the Accused Product by a customer. Rein Tech's contentions do not provide any indication or cite any evidence that Mueller is responsible for installing the LoRaWAN Combination nor using the completed system after installation.*

**Response:**

**Paradiso continues to ignore the Certificate of Correction using the pre-CofC claim language which is presented with strikeout applied. The CofC claim is presented in bold.**

~~the one or more wireless communication technologies capable of transmitting at least one of a 1) water use data, water energy use data, water quality data and leak detection information and, 2) obtains an instruction or signal to command the management of the water control valve or perform a command operation, using at~~

~~least one of an Internet connection, a private network system, and a corporate owned network system, and a smart phone, computer, server, tablet, web portal, and other electronic communication device, that communicates with at least one of a remote computer or server, a commercial cloud-company, and a web-based company."~~

**the one or more wireless communication technologies configured to: (i) transmit at least one of the water use data, the water energy use data, the water quality data, or the leak detection information, or any combination thereof, to the one or more remote computers or servers or to the cloud computing company; and (ii) receive an instruction or signal to command the management of the water control valve mechanism or perform another command operation; using at least one of an Internet connection, a private network system, or a corporate owned network system that communicates with a smart phone, a computer, a server, a tablet, a web portal, or another electronic communication device.**

**The '837 Claim Chart provided to the Defendant incorporates the Certificate of Correction claim language.**

**Per Mueller, "REMOTE DISCONNECT ENABLED COMPATIBILITY - Eliminate the need for truck rolls; the node is compatible with Mueller Systems 420RDM. Utilities can remotely initiate a command to turn water service on or off" (Exhibit 2 at RT009369 in Klicpera's Expert Witness Report); "Remote Disconnect Enabled Compatibility" and "Compatible with Mueller System 420 RDM, water utilities can remotely initiate a command to turn a water service on or off" (Exhibit 3 at RT009371 in Klicpera's Expert Witness Report); "The Mi.Net LW node has the built-in capability to seamlessly connect with Mueller Systems Model 420 RDM (Remote Disconnect Meter) that allows easy and**

**secure remote valve actuation to turn water service on or off." (Exhibit 4 at RT009376 in Klicpera's Expert Witness Report).**

**Plaintiff provided evidence that Mueller is responsible for installing the LoRa Combination (refer to Exhibit A, which contains exhibit pages from Klicpera's Expert Witness Report). Plaintiff's Research Attorney discovered the agreement for Mueller water meter installations in Newport Beach, CA beginning in 2023. This exhibit was previously provided to Paradiso but he apparently ignored it. This exhibited Purchase, Installation and Maintenance Amended Agreement, dated the 25th of May 2023 (after the '837 Patent issue date), was signed by Mueller Systems, LLC Vice President/General Manager Eric Stacey and Assistant Secretary Chason Carroll. This Agreement states that Mueller System, LLC would be paid eight million, one hundred and fifty thousand dollars ("8,150,000.00"). Contractor Mueller would be required for all Work performed in accordance with this Agreement including all reimbursable items, subcontractor fees, for the base contract amount. Hence, while Mueller states that they did not install the infringing water meters, they were paid for such and were responsible for the plumbing installers or contractors and work. Mueller most likely installed their network system and developed the software for the Sentryx API for communicating with Amazon Web Services ("AWS"). Defendant Mueller maintains water data databases at the AWS and network operation center in Atlanta and likely elsewhere (web portal). Defendant Mueller Attorneys completely failed to disclose the Newport Beach water district and the $8,150,000 contract. It can be assumed that Mueller would use the same procedure, i.e., Purchase, Installation and Maintenance Agreement, with other sites that Mueller had not disclosed, including Calaveras County, California; Santa Rosa County, Florida; Dayton Beach, Florida; West Slope, Oregon, and any other nondisclosed sites.**

**Furthermore, Defendant Mueller provides instructions on how to install their water meters and how to connect to the cellular or LoRa network. (See Exhibits B and C)**

**Mueller's Installed Water Meter**

Mr. Paradiso's Opinion:

*78. Additionally, Mueller does not directly infringe because the Accused Product is not made, sold, offered for sale, or imported by Mueller with "a smart phone, computer, server, tablet, web portal, and other electronic communication device." Even if this were not the case, the smart phone, computer, server, tablet, web portal, and other electronic communication device does not "communicate[] with at least one of a remote computer or server, a commercial cloud-company, and a web-based company" when the Accused Product is made, sold, offered for sale, or imported by Mueller. Such can occur (if at all) only after installation and during use of the Accused Product by a customer. Rein Tech's contentions do not provide any indication or cite any evidence that Mueller is responsible for installing the Cellular Combination nor using the completed system after installation.*

**Response:**

**Exhibits G and J display a mobileRDM that demonstrates a cell phone with a Meuller water APP to remotely connect or disconnect water services using a two-way radio. While a user or a corporate car is within 1000 feet a service connection, selecting a function**

**on the Mueller water APP a signal is transferred to the Mueller water meter. The water meter 25-30 second process (pairing the mobileRDM) confirms that the user signal has been sent. Once connected with the mobileRDM application, water service can be connected or disconnected. The mobileRDM application confirms to the user when the process is complete. One of the phone settings is the Reset (or Preset) button.**

**Attached in Exhibits G is a Mobile APP Mueller document which describes Benefits of AMR/AMI Systems at the Touch of a Button. With the mobileRDM application, utility workers can remotely check the status of service connections, read meters, and connect or disconnect water service all from an Android smart phone using a 2-way radio connection. The application does not require an automated meter reading or advanced metering infrastructure system, but it can be used on any existing system. Another benefit of the application is that utilities can deploy it incrementally and expand its use to other geographic service areas without significant capital expenditure.**

**Plaintiff has evidence that Mueller Systems was selected by Pace Water System in Santa Rosa County, Florida, to deploy a pilot program for their water meter system which includes new features that allow customers to control their meter from a mobile phone (Exhibit I). The integration uses Mueller's Sentryx API (Application Programming Interface) to integrate the existing system with a customer-facing mobile app from Dropcountr, a cloud-based data analytics and customer engagement application for water utilities. Customers who opt in can see their hourly water usage and turn their water on or off from their phone. This app gives customers the ability to remotely control the water supply to their house.**

**Plaintiff has evidence that Mueller was responsible for installing, testing, and maintaining the corporate network per their agreement with Newport Beach, California**

**(Exhibits B and C). Mueller trained utility workers to use the corporate network that Muller installed. These activities were contracted per a major (single) sale agreement between Defendant Mueller and the City of Newport Beach, California.**

**Plaintiff provided evidence that Mueller is responsible for installing the LoRa Combination (refer to Exhibit A, which contains exhibit pages from Klicpera's Expert Witness Report). Plaintiff's Research Attorney discovered the agreement for Mueller water meter installations in Newport Beach, CA beginning in 2023. This exhibit was previously provided to Paradiso, but he apparently ignored it. This exhibited Purchase, Installation and Maintenance Amended Agreement, dated the 25th of May 2023 (after the '837 Patent issue date), was signed by Mueller Systems, LLC Vice President/General Manager Eric Stacey and Assistant Secretary Chason Carroll. This Agreement states that Mueller System, LLC would be paid eight million, one hundred and fifty thousand dollars ("8,150,000.00"). Contractor Mueller would be required for all Work performed in accordance with this Agreement including all reimbursable items, subcontractor fees, for the base contract amount. Hence, while Mueller states that they did not install the infringing water meters, they were paid for such and were responsible for the plumbing installers or contractors and work. Mueller most likely installed their network system and developed the software for the Sentryx API for communicating with Amazon Web Services ("AWS"). Defendant Mueller maintains water data databases at the AWS and network operation center in Atlanta and likely elsewhere (web portal). Defendant Mueller Attorneys completely failed to disclose the Newport Beach water district and the $8,150,000 contract. It can be assumed that Mueller would use the same procedure, i.e., Purchase, Installation and Maintenance Agreement, with other sites that Mueller had not disclosed, including**

**Calaveras County, California; Santa Rosa County, Florida; Dayton Beach, Florida; West Slope, Oregon, and any other nondisclosed sites.**

**Furthermore, Defendant Mueller provides instructions on how to install their water meters and how to connect to the cellular or LoRa network. (See Exhibits B and C)**

**Mueller's Installed Water Meter**

**2) CLAIM 45**

Mr. Paradiso's Opinion:

None given.

**Response:**

**No response provided since no there was no opinion.**

**3) CLAIM 47**

Mr. Paradiso's Opinion:

*79. In my opinion, Claim 47 is not directly infringed by the LoRaWAN Combination for the reasons similar to those discussed in the preceding subsection. For example, the Accused Products do not include "a smart phone, computer, server, tablet, web portal [or] one or more other electronic communication devices." The Accused Products are not made, sold, offered for sale, or imported by Mueller with "a smart phone, computer, server, tablet, web portal [or] one*

*or more other electronic communication devices." Even if this were not the case, the smart phone, computer, server, tablet, web portal [or] one or more other electronic communication devices is not capable of being "used" to perform any of the functions recited in this limitation when the Accused Product is made, sold, offered for sale, or imported by Mueller. Such can occur (if at all) only after installation and during use of the Accused Product by a customer. Rein Tech's contentions do not provide any indication or cite any evidence that Mueller is responsible for installing the LoRaWAN Combination nor using the completed system after installation.*

**Response:**

**Exhibits G and J display a mobileRDM that demonstrates a cell phone with a Meuller water APP to remotely connect or disconnect water services using a two-way radio. While a user or a corporate car is within 1000 feet a service connection, selecting a function on the Mueller water APP a signal is transferred to the Mueller water meter. The water meter 25-30 second process (pairing the mobileRDM) confirms that the user signal has been sent. Once connected with the mobileRDM application, water service can be connected or disconnected. The mobileRDM application confirms to the user when the process is complete. One of the phone settings is the Reset (or Preset) button.**

**Attached in Exhibits G is a Mobile APP Mueller document which describes Benefits of AMR/AMI Systems at the Touch of a Button. With the mobileRDM application, utility workers can remotely check the status of service connections, read meters, and connect or disconnect water service all from an Android smart phone using a 2-way radio connection. The application does not require an automated meter reading or advanced metering infrastructure system, but it can be used on any existing system. Another benefit of the application is that utilities can deploy it incrementally and expand its use to other geographic service areas without significant capital expenditure.**

**Plaintiff has evidence that Mueller Systems was selected by Pace Water System in Santa Rosa County, Florida, to deploy a pilot program for their water meter system which includes new features that allow customers to control their meter from a mobile phone (Exhibit I). The integration uses Mueller's Sentryx API (Application Programming Interface) to integrate the existing system with a customer-facing mobile app from Dropcountr, a cloud-based data analytics and customer engagement application for water utilities. Customers who opt in can see their hourly water usage and turn their water on or off from their phone. This app gives customers the ability to remotely control the water supply to their house.**

**Plaintiff has evidence that Mueller was responsible for installing, testing, and maintaining the corporate network per their agreement with Newport Beach, California (Exhibits B and C). Mueller trained utility workers to use the corporate network that Muller installed. These activities were contracted per a major (single) sale agreement between Defendant Mueller and the City of Newport Beach, California.**

**Plaintiff provided evidence that Mueller is responsible for installing the LoRa Combination (refer to Exhibit A, which contains exhibit pages from Klicpera's Expert Witness Report). Plaintiff's Research Attorney discovered the agreement for Mueller water meter installations in Newport Beach, CA beginning in 2023. This exhibit was previously provided to Paradiso, but he apparently ignored it. This exhibited Purchase, Installation and Maintenance Amended Agreement, dated the 25th of May 2023 (after the '837 Patent issue date), was signed by Mueller Systems, LLC Vice President/General Manager Eric Stacey and Assistant Secretary Chason Carroll. This Agreement states that Mueller System, LLC would be paid eight million, one hundred and fifty thousand dollars ("8,150,000.00"). Contractor Mueller would be required for all Work performed in**

**accordance with this Agreement including all reimbursable items, subcontractor fees, for the base contract amount. Hence, while Mueller states that they did not install the infringing water meters, they were paid for such and were responsible for the plumbing installers or contractors and work. Mueller most likely installed their network system and developed the software for the Sentryx API for communicating with Amazon Web Services ("AWS"). Defendant Mueller maintains water data databases at the AWS and network operation center in Atlanta and likely elsewhere (web portal). Defendant Mueller Attorneys completely failed to disclose the Newport Beach water district and the $8,150,000 contract. It can be assumed that Mueller would use the same procedure, i.e., Purchase, Installation and Maintenance Agreement, with other sites that Mueller had not disclosed, including Calaveras County, California; Santa Rosa County, Florida; Dayton Beach, Florida; West Slope, Oregon, and any other nondisclosed sites.**

**Furthermore, Defendant Mueller provides instructions on how to install their water meters and how to connect to the cellular or LoRa network. (See Exhibits B and C)**

**Mueller's Installed Water Meter**

**4) CLAIM 48**

Mr. Paradiso's Opinion:

*80. It is my opinion that the LoRaWAN Combination does not infringe because the Accused Products (with a Cellular or LoRaWAN Node) do not include mesh or peer-to-peer technology circuitry that can communicate with at least one of another water meter collection nodes and communication hubs. A 420RDM (with Cellular Node) can wirelessly communicate only with a cell phone tower and a 420 RDM (with LoRaWAN Node) can communicate only with a third-party LoRaWAN gateway. Neither the cellular tower nor the third-party LoRaWAN gateway incorporate mesh or peer-to-peer technology.*

*82. Further, Rein Tech's contentions do not establish that this element is met because the contentions rely solely on mesh technology of Mi.Mesh, which I understand to be incompatible with Cellular and LoRaWAN Nodes. Accordingly, these contentions do not demonstrate that the Accused Products meet these limitations.*

**Response:**

**Paradiso continues to ignore the claims defined in the Certificate of Correction. Claim 48 reads, "A water meter and leak detection system as recited in claim 45, wherein the base station includes at least one of a mesh or a peer-to-peer technology circuitry that communicates with a one or more base stations or the one or more communication hubs."**

**Dependent Claim 45 introduces the claim language of using a communication hub which is equivalent to the Mi.NET and Mi.NET repeaters, Mi.Node Owl, Mi.Node AC Repeater, and Mi.Node DC repeater (Exhibit H).**

**The '837 Claim Chart provided to the Defendant incorporates the Certificate of Correction claim language. The Mueller 420 RDM and SSM with Mi.Net® LW Meter Interface and Cellular Node Meter Interface with Mi.Net®, one of collection nodes are capable of including at least one of a mesh and/or and peer-to-peer technology circuitry that can communicate with at least one of another water meter collection nodes and**

**communication hubs, "This document specifies the Mi.Mesh protocol stack. This document details the precise mechanisms and message formats used to convey data reliably between two devices equipped with the radio modules. Flow diagrams, message format definitions, and transaction examples give a complete definition of the protocol as it appears over the air and in system memory." and "The Mi.Mesh protocol stack is a frequency-hopping protocol that is designed to permit reliable data delivery between any two nodes. The stack is divided into 4 layers, roughly corresponding to the open systems interconnect model. Layer 1, the physical level, is the 900 MHz spread spectrum radio and driver module responsible for over-the-air transmission and reception of data. Layer 2, the link level, is responsible for reliable point-to-point communications between any pair of directly connected nodes. Layer 3, the network level, provides networking functions including routing, message forwarding, and security. Layer 4, the application services level, is responsible for implementing the client and server processes that provide the basic mesh functions that MiNode applications require, including uploading data, priority message delivery, and device command and control." (Exhibit 15 at MUE000000038-MUE000000051 and Exhibit 20 at MUE000000073- MUE000000076 in Klicpera's Expert Witness Report).**

**Plaintiff has evidence that Mueller was responsible for installing, testing, and maintaining the corporate network per their agreement with Newport Beach, California (Exhibits B and C). Mueller trained utility workers to use the corporate network that Muller installed. These activities were contracted per a major (single) sale agreement between Defendant Mueller and the City of Newport Beach, California.**

**Plaintiff provided evidence that Mueller is responsible for installing the LoRa Combination (refer to Exhibit A, which contains exhibit pages from Klicpera's Expert**

**Witness Report). Plaintiff's Research Attorney discovered the agreement for Mueller water meter installations in Newport Beach, CA beginning in 2023. This exhibit was previously provided to Paradiso, but he apparently ignored it. This exhibited Purchase, Installation and Maintenance Amended Agreement, dated the 25th of May 2023 (after the '837 Patent issue date), was signed by Mueller Systems, LLC Vice President/General Manager Eric Stacey and Assistant Secretary Chason Carroll. This Agreement states that Mueller System, LLC would be paid eight million, one hundred and fifty thousand dollars ("8,150,000.00"). Contractor Mueller would be required for all Work performed in accordance with this Agreement including all reimbursable items, subcontractor fees, for the base contract amount. Hence, while Mueller states that they did not install the infringing water meters, they were paid for such and were responsible for the plumbing installers or contractors and work. Mueller most likely installed their network system and developed the software for the Sentryx API for communicating with Amazon Web Services ("AWS"). Defendant Mueller maintains water data databases at the AWS and network operation center in Atlanta and likely elsewhere (web portal).**

**The Mueller 420 RDM and SSM with Mi.Net® LW Meter Interface and Cellular Node Meter Interface with Mi.Net®, one of collection nodes are capable of including at least one of a mesh and/or and peer-to-peer technology circuitry that can communicate with at least one of another water meter collection nodes and communication hubs. Defendant Mueller stated that "This document specifies the Mi.Mesh protocol stack. This document details the precise mechanisms and message formats used to convey data reliably between two devices equipped with the radio modules. Flow diagrams, message format definitions, and transaction examples give a complete definition of the protocol as it appears over the air and in system memory." and "The Mi.Mesh protocol stack is a**

**frequency-hopping protocol that is designed to permit reliable data delivery between any two nodes. The stack is divided into 4 layers, roughly corresponding to the open systems interconnect model. Layer 1, the physical level, is the 900 MHz spread spectrum radio and driver module responsible for over-the-air transmission and reception of data. Layer 2, the link level, is responsible for reliable point-to-point communications between any pair of directly connected nodes. Layer 3, the network level, provides networking functions including routing, message forwarding, and security. Layer 4, the application services level, is responsible for implementing the client and server processes that provide the basic mesh functions that MiNode applications require, including uploading data, priority message delivery, and device command and control." (Exhibit 15 at MUE000000038-MUE000000051 and Exhibit 20 at MUE000000073- MUE000000076 in Klicpera's Expert Witness Report).**

Mr. Paradiso's Opinion:

*81. Notably, independent claim 42 does not include "collection nodes," or "communication hubs," and Rein Tech's identification of Accused Products does not include any type of collection node or communication hub. Accordingly, Mueller does not directly infringe this claim because the Accused Products do not include these elements and are not made, sold, offered for sale or imported by Mueller with a "collection node" or a communication hub.*

**Response:**

**Paradiso continues to ignore the claims defined in the Certificate of Correction. Claim 49 reads, "A water meter and leak detection system as recited in claim 45, wherein the one or more communication hubs includes at least one of a mesh or a peer-to-peer technology circuitry that communicates with a one or more base stations."**

**Dependent Claim 45 introduces the one or more communication hubs which is equivalent to the Mi.NET and Mi.NET repeaters, Mi.Node Owl, Mi.Node AC repeater, and Mi.Node DC repeater (Exhibit H). Paradiso's understanding is incorrect. The communication hubs primary extends the range of the wireless communication technology and further, if needed, can perform mesh technology with one or more water meters.**

**5) CLAIM 49**

Mr. Paradiso's Opinion:

*83. In my opinion, Claim 49 is not infringed by the Accused Products for substantially the same reasons discussed with respect to Claim 48.*

*84. The Accused Products (with a Cellular or LoRaWAN Node) do not include mesh or peer-to-peer technology circuitry that can communicate with at least one of another water meter collection nodes and communication hubs. A 420RDM (with Cellular Node) can wirelessly communicate only with a cell phone tower and a 420 RDM (with LoRaWAN Node) can communicate only with a third-party LoRaWAN gateway. Neither the cellular tower nor the third party LoRaWAN gateway incorporate mesh or peer-to-peer technology.*

**Response:**

**The '837 Claim Chart provided to the Defendant incorporates the Certificate of Correction claim language. Claim 49 reads, "A water meter and leak detection system as recited in claim 45, wherein the one or more communication hubs includes at least one of a mesh or a peer-to-peer technology circuitry that communicates with a one or more base stations."**

**The Mueller 420 RDM and SSM with Mi.Net® LW Meter Interface and Cellular Node Meter Interface with Mi.Net®, one of collection nodes, are capable of including at**

**least one of a mesh and/or and peer-to-peer technology circuitry that can communicate with at least one of another water meter collection nodes and communication hubs. Defendant Mueller stated that "This document specifies the Mi.Mesh protocol stack. This document details the precise mechanisms and message formats used to convey data reliably between two devices equipped with the radio modules. Flow diagrams, message format definitions, and transaction examples give a complete definition of the protocol as it appears over the air and in system memory." and "The Mi.Mesh protocol stack is a frequency-hopping protocol that is designed to permit reliable data delivery between any two nodes. The stack is divided into 4 layers, roughly corresponding to the open systems interconnect model. Layer 1, the physical level, is the 900 MHz spread spectrum radio and driver module responsible for over-the-air transmission and reception of data. Layer 2, the link level, is responsible for reliable point-to-point communications between any pair of directly connected nodes. Layer 3, the network level, provides networking functions including routing, message forwarding, and security. Layer 4, the application services level, is responsible for implementing the client and server processes that provide the basic mesh functions that MiNode applications require, including uploading data, priority message delivery, and device command and control." (Exhibit 15 at MUE000000038-MUE000000051 and Exhibit 20 at (MUE000000073- MUE000000076 in Klicpera's Expert Witness Report).**

**Dependent Claim 45 introduces the one or more communication hubs which is equivalent to the Mi.NET and Mi.NET repeaters, Mi.Node Owl, Mi.Node AC repeater, and Mi.Node DC repeater (Exhibit H).**

**Plaintiff has evidence that Mueller was responsible for installing, testing, and maintaining the corporate network per their agreement with Newport Beach, California**

**(Exhibits B and C). Mueller trained utility workers to use the corporate network that Muller installed. These activities were contracted per a major (single) sale agreement between Defendant Mueller and the City of Newport Beach, California.**

**Plaintiff provided evidence that Mueller is responsible for installing the LoRa Combination (refer to Exhibit A, which contains exhibit pages from Klicpera's Expert Witness Report). Plaintiff's Research Attorney discovered the agreement for Mueller water meter installations in Newport Beach, CA beginning in 2023. This exhibit was previously provided to Paradiso, but he apparently ignored it. This exhibited Purchase, Installation and Maintenance Amended Agreement, dated the 25th of May 2023 (after the '837 Patent issue date), was signed by Mueller Systems, LLC Vice President/General Manager Eric Stacey and Assistant Secretary Chason Carroll. This Agreement states that Mueller System, LLC would be paid eight million, one hundred and fifty thousand dollars ("8,150,000.00"). Contractor Mueller would be required for all Work performed in accordance with this Agreement including all reimbursable items, subcontractor fees, for the base contract amount. Hence, while Mueller states that they did not install the infringing water meters, they were paid for such and were responsible for the plumbing installers or contractors and work. Mueller most likely installed their network system and developed the software for the Sentryx API for communicating with Amazon Web Services ("AWS"). Defendant Mueller maintains water data databases at the AWS and network operation center in Atlanta and likely elsewhere (web portal).**

Mr. Paradiso's Opinion:

*85. Notably, independent claim 42 does not include "collection nodes," or "communication hubs," and Rein Tech's identification of Accused Products does not include any type of collection*

*node or communication hub. Accordingly, Mueller does not directly infringe this claim because the Accused Products do not include these elements and are not made, sold, offered for sale or imported by Mueller with a "collection node" or a communication hub.*

*86. Further, Rein Tech's contentions fail to establish that this element is met because the contentions rely solely on mesh technology of Mi.Mesh, which I understand to be incompatible with Cellular and LoRaWAN Nodes. Accordingly, these contentions do not demonstrate that the Accused Products meet these limitations.*

**Response:**

**Paradiso continues to ignore the claims defined in the Certificate of Correction. Claim 49 reads, "A water meter and leak detection system as recited in claim 45, wherein the one or more communication hubs includes at least one of a mesh or a peer-to-peer technology circuitry that communicates with a one or more base stations."**

**Dependent Claim 45 introduces the one or more communication hubs which is equivalent to the Mi.NET and Mi.NET repeaters, Mi.Node Owl, Mi.Node AC repeater, and Mi.Node DC repeater (Exhibit H). Paradiso's understanding is incorrect. The communication hubs primary extends the range of the wireless communication technology and further, if needed, can perform mesh technology with one or more water meters.**

## D. THE CERTIFICATE OF CORRECTION IS VALID

Mr. Paradiso's Opinion:

*87. The Klicpera Report references a certificate of correction that was issued for the '837 Patent on October 10, 2024 (the "Certificate of Correction") (Klicpera Report at p. 3).*

*88. I understand that Rein Tech has not supplemented its Final Infringement Contentions to assert any claims of the '837 Patent as "corrected" by the Certificate of Correction. Neither*

*Rein Tech nor Klicpera has provided a claim chart or other analysis seeking to show that the Accused Products infringe any of the corrected claims. As a result, I am unable to respond substantively to any infringement allegations relating to the Certificate of Correction.*

**Response:**

**Defendant was fully aware of the '837 Certificate of Correction before it was approved on October 15, 2024. Defendant accepted multiple Court stays specifically to allow time for the Certificate of Correction to be prosecuted and approved. The initial, issued and publicly available Certificate of Correction was printed in an odd font and difficult-to-read format. The USPTO informed Klicpera that it would be reprinted as a final document in clear, readable font/format and advised Klicpera to review the final document to ensure no errors were introduced. The final document was published by the USPTO in March 2025. Klicpera promptly reviewed the final document and provided the updated '837 Claim Chart to Mueller soon thereafter.**

**Mueller's expert, Paradiso wrote his opening and rebuttal expert reports with complete knowledge of the '837 Certificate of Correction. Beyond the public availability of the Certificate of Correction, a copy of the initial version was provided with Klicpera's first expert witness report, and subsequently Rein Tech's updated '837 Claim Chart sent to Mueller included the Certificate of Correction claim language. Paradiso chose to ignore the Certificate of Correction claim language. and that error and waste of time is his responsibility and that of the Defendant. And, as a result, Klicpera had to spend extra time on Mueller's Expert Witness Report to address Paradiso's mistakes.**

Mr. Paradiso's Opinion:

*89. To the extent Rein Tech asserts that any of the corrected claims are infringed, it is my opinion that the Certificate of Correction is invalid.*

*90. As shown below for independent claim 42, the Certificate of Correction purports to make numerous, substantive amendments to the original claim as issued in the '837 Patent:*

**Response:**

**All corrections in the '837 Certificate of Corrections met the criteria of USPTO MPEP 1481 and MPEP 1485, and the Certificate of Corrections was reviewed and approved by USPTO. No new matter was introduced and no expansion to the scope of the claims was made by the Certificate of Correction.**

**Mr. Paradiso's opinion contradicts the review and decision making by the USPTO.**

Mr. Paradiso's Opinion:

*91. It is my opinion that the Certificate of Correction broadened the scope of claim 42.*

**Response:**

**All corrections in the '837 Certificate of Corrections met the criteria of USPTO MPEP 1481 and MPEP 1485, and the Certificate of Corrections was reviewed and approved by USPTO. Mr. Paradiso's opinion contradicts the review and decision making by the USPTO.**

**All corrections in the '837 Certificate of Corrections met the criteria of MPEP 1481 and MPEP 1485. No corrections involved changes that constituted new matter or broadened the scope of the '837 claims.**

Mr. Paradiso's Opinion:

*92. For (1) above, before the correction Rein Tech could only establish infringement*

*by demonstrating that the base station was interposed between a main water supply line and a water supply for a building or structure. A base station interposed upstream from a main water supply line would not have infringed the original claim. However, the phrase "main water source" may be broad enough to cover a water infrastructure system upstream to the origin of the water, such as at a water treatment plant. After the correction, a base station interposed upstream from a main water supply line yet still between a main water source and a water supply line for a building or a structure falls within the scope of the corrected claims and would infringe.*

**Response:**

**All claims are in accordance with the specification per USPTO policy. Accordingly, a POSITO would view Mr. Paradiso assertion and characterization of the broadening as wrong and ridiculous.**

Mr. Paradiso's Opinion:

*93. For (2) above, before the correction Rein Tech could only establish infringement by demonstrating that one or more flow rate sensors was connected to the main water supply. The Court construed the limitation of "one or more flow rate sensor[s] connected to the main water supply" to mean "one or more devices coupled directly to the main water supply to measure the rate of a flow of water through said water supply." (D.I. 151, p. 2). Accordingly, a flow rate sensor that was not connected directly to the main water supply would not have infringed the original claim. After the correction, however, a flow rate sensor that is not connected to the main water supply (let alone directly connected to the main water supply line)6 falls within the scope of the corrected claims and would infringe.*

**Response:**

**Terms in the Joint Claim Construction Chart were agreed upon by Mueller and Rein Tech, Inc., and the chart was submitted to the Court. Paradiso has no authority to challenge agreed-upon terminology.**

Mr. Paradiso's Opinion:

*94. For (3) above, before the correction Rein Tech could only establish infringement by demonstrating that one or more wireless communication technologies comprised at least one of a LoRa, Sigfox, Ultra Narrow Band, a NB-IoT, LTE-M cellular, and 5G technology. A wireless communication technology comprised of WiMAX would not have infringed the original claim. After the correction, however, a wireless communication technology comprised of WiMAX falls within the scope of the corrected claims and would infringe.*

**Response:**

**A minor correction was made to align wireless communications technology terms consistently in two locations in Claim 42. WiMAX was already present in the claim and specification.**

Mr. Paradiso's Opinion:

*95. For (4) above, before the correction Rein Tech could only establish infringement by demonstrating that the one or more wireless communication technologies consists of a duplex technology to receive at least one of water use data, water energy use data, water quality data, or leak detection information. A wireless communication technology consisting of a duplex technology to transmit at least one of water use data, water energy use data, water quality data, or leak detection information would not have infringed the original claim. After the correction; however, wireless communication technology consisting of a duplex technology to transmit at*

*least one of water use data, water energy use data, water quality data, or leak detection information falls within the scope of the claim. Because the "one or more wireless communication technologies" in question are comprised by the base station ("said base station comprising . . . d) one or more wireless communication technologies . . ."), this change essentially changes the scope of the claim to cover base stations that transmit water use data, water energy use data, water quality data, and/or leak detection information from the original claims that covered base stations required to receive the same.*

**Response:**

**Thus, the '837 Certificate of Correction lists of wireless communication technologies is aligned in Claim 42 elements d and f. Also, Claim 42 states that duplex technology transmits water data and sends (remote) commands to regulate the water control valve mechanism.**

**A POSITA would understand that Claim 42 includes the limitation of "wherein the one or more wireless communication technologies comprising at least one of the LoRa, the Sigfox, the Ultra Narrow Band (UNB), the 6LoWPAN, the WiMAX, the NB-IoT, the 3GPP cellular, the 4G/LTE-M cellular, or the 5G cellular technology, or any combination thereof, consists of a duplex technology to <u>transmit</u> the water use data, the water energy use data, the water quality data, or the leak detection information, or any combination thereof, and send commands to regulate the water control valve mechanism".**

Mr. Paradiso's Opinion:

*96. For (5) above, before the correction Rein Tech could only establish infringement by demonstrating that the programming setting perform one or more of four specific functions,*

*recited in limitations (a)-(d). A programming setting that could modify water units or timing units or establish alarm set points would not have infringed the original claim. After the correction, however, a programming setting that can modify water units or timing units or establish alarm set points falls within the scope of the corrected claims and would infringe.*

**Response:**

**Regarding the case that Paradiso argues above, there was absolutely no new matter added or broadening of the claims. A minor correction for consistency was made to insert two phrases already present in other claims (and supported by the specification).**

Mr. Paradiso's Opinion:

*97. To the extent that these amendments correct mistakes in the original claims, it is my opinion that none of the mistakes would have been apparent to a POSA. Indeed, Klicpera states that "[t]his Certificate of Correction addressed Defendant's Invalidity Contentions." (Klicpera Report at p. 3.) A POSA could not discern from the '837 Patent or its file history that the original claims should be "corrected" in the manners shown above. The public therefore had no effective notice of such "corrections."*

**Response:**

**A POSITA would clearly see that the corrections made were not to address any document nor contentions. The corrections were made in accordance with USPTO policy and processed accordingly. The '837 Patent and Certificate of Correction are valid.**

Mr. Paradiso's Opinion:

*98. Accordingly, it is my opinion that the Certificate of Correction impermissibly broadened the scope of at least claim 42 and is therefore invalid.*

**Response:**

**A POSITA would understand from the context of the specification, file history, and the claims that Certificate of Correction for Claim 42 is acceptable and valid. There is absolutely no broadening of the scope of Claims 42, 45, and 47-49.**

**A POSITA would view the arguments made by Paradiso as not meeting the clear and convincing standard [for invalidity that I4I requires. Furthermore, the conclusion by Paradiso that the Certificate of Correction is not valid indicates he disrespects the knowledge and decisions of the USPTO representatives, employees, and director. He attests that the USPTO The USPTO representative, employees, and the director of the USPTO, have all made errors in applying the USPTO rules and policies in granting the '837 Certificate of Correction.**

**In the Microsoft v. I4I case, one of the main issues is the duty to challenge a patent and Certificate of Correction under the clear and convincing standard. Eliminating the clear and convincing standard might discourage the filing of bad patents, but it would also chill the filing of good patents. Congress itself provided further support for this argument when, following the last Term, it passed the Leahy-Smith America Invents Act. The Act made sweeping changes to the patent system but left the clear and convincing standard of review in place. The Court also stated that Congress determined that a patent and its Certificate of Correction is "presumed valid," under the clear and convincing standard of proof.**

**In the Microsoft v. I4I case, one of the main issues is the duty to challenge a patent and its Certificate of Correction under the clear and convincing standard. Eliminating the clear and convincing standard might discourage the filing of bad patents, but it would also chill the filing of good patents. Congress itself provided further support for this argument**

**when, following the last Term, it passed the Leahy-Smith America Invents Act. The Act made sweeping changes to the patent system but left the clear and convincing standard of review in place. The Court also stated that Congress determined that a patent is "presumed valid," under the clear and convincing standard of proof.**

**A POSITA would use the claim language defined in the Certificate of Correction and would understand from the context of the specification, file history, the prosecution history and concluded that claims that Claims 42, 45, and 47-49 are adequately valid. A POSITA would view the arguments made by Paradiso as not meeting the clear and convincing standard that Microsoft Corp. v. i4i Limited Partnership, 564 U.S. 91 (2010) requires. In addition, a POSITA expects the USPTO representatives, employees, and the director of the USPTO, who understand from the context of the specification, file history, made a proper considerate and supportive decision that Claims 42, 45 and 47-49, through the Certificate of Correction, are adequately valid.**

**when, following the last Term, it passed the Leahy-Smith America Invents Act. The Act made sweeping changes to the patent system but left the clear and convincing standard of review in place. The Court also stated that Congress determined that a patent is "presumed valid," under the clear and convincing standard of proof.**

**A POSITA would use the claim language defined in the Certificate of Correction and would understand from the context of the specification, file history, the prosecution history and concluded that claims that Claims 42, 45, and 47-49 are adequately valid. A POSITA would view the arguments made by Paradiso as not meeting the clear and convincing standard that Microsoft Corp. v. i4i Limited Partnership, 564 U.S. 91 (2010) requires. In addition, a POSITA expects the USPTO representatives, employees, and the director of the USPTO, who understand from the context of the specification, file history, made a proper considerate and supportive decision that Claims 42, 45 and 47-49, through the Certificate of Correction, are adequately valid.**

**/Michael E. Klicpera/**

**Rein Tech Principal**

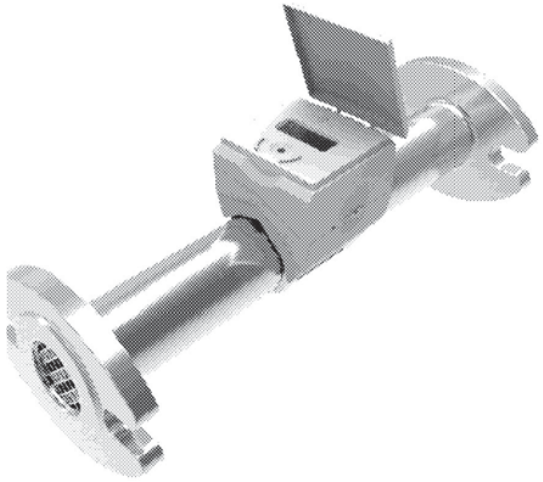
**24 April 2025**

# EXHIBIT M

**Plaintiff Rein Tech Inc.'s**
**U.S. Patent No. 11,549,837 ('837 Patent)**
**Claims 42, 45, 47, 48, and 49**

Accused Products
Mueller 420RDM (Remote Disconnect Meter)
Mi.Net® LoRaWAN (LW) Meter Interface Unit (Node)
Solid State Meter (SSM)
Cellular Node Meter Interface with Mi.Net®
Private or Corporate Network with Remote Computers or Servers or Cloud Computing Company

| '837 Patent Claim 42 | |
|---|---|
| A water meter and leak detection system comprising: | The Mueller 420 RDM and SSM, with LoRaWAN (LW) Node or Cellular Node, utilizing Mi.Net® is a water meter and leak detection system: |
| a base station having a water control valve mechanism interposed between a main water source and a water supply line lor a building or a structure; | The Mueller 420 RDM and SSM has a base station (Exhibit 5 at Bates No. MUE000000119 and MUE000000121, Exhibit 18 at Bates No. MUE000000088 to 0000000093, Exhibit 20 at Bates No. MUE000000165 and MUE00000191, and Exhibit 22 at Bates No. MUE000000001 to MEU0000000002).<br> <br>5/8" x 3/4" Remote Disconnect Meter<br>(Exhibit 5 at Bates No. MUE000000119) |



**Mueller Systems Solid State Meter**
**Sizes 1½" & 2"**

(Exhibit 20 at Bates No. MUE000000176)

**Mueller Systems Solid State Meter**
**5/8" X 3/4" - 1"**

(Exhibit 20 at Bates No. MUE000000179)

a water control valve mechanism; "**Remote Disconnect Enabled Compatibility**" "**Compatible with Mueller System 420 RDM, water utilities can remotely initiate a command to turn a water service on or off.**" (Exhibit 3 at Bates No. RT009371).

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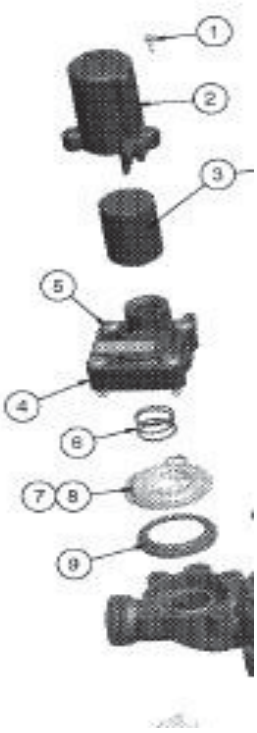
| | "**The Mi.Net LW node has the built-in capability to seamlessly connect with Mueller Systems Model 420 RDM (Remote Disconnect Meter) that allows easy and secure remote valve actuation to turn water service on and off.**" (Exhibit 4 at Bates No. RT009376).<br><br>"**The pilot valve can be actuated vis the User Interface from any web enabled device with the proper log in and password.**" (Exhibit 5 at Bates No. MUE000000121).<br><br>  <br><br>(Exhibit 5 at Bates No. MUE000000121)<br><br>interposed between a main water line and a water supply for said building or structure water system; "**External straight pipe threads (NPSM)**" (Exhibit 5 at Bates No. MUE000000119 and MUE000000122). |

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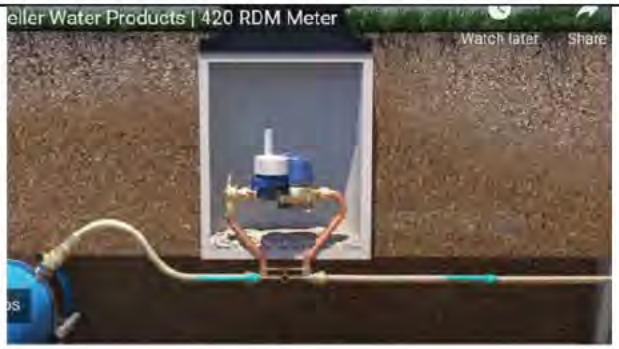
| |  <br>(Exhibit 9 at Bates No. RT009384)<br><br>https://muellersystems.com/<br>https://muellersystems.com/420-remote-disconnect-meter-rdm/ |
| the base station further comprising: | |
| a) an electrical circuitry including at least one of a CPU, a microprocessor, or a microcontroller, or any combination thereof; | The Mueller 420 RDM and SSM has an electrical circuitry; "**coated electronic board**", (Exhibit 1 at Bates No. RT009366 and Exhibit 2 at Bates No. RT009368), including at least one of a CPU, a microprocessor or a microcontroller [**one skilled in the art would understand that a CPU a microprocessor or a microcontroller with software instructions would be necessary to provide the functions of the water meter, such as organizing the recording and storage in memory, transmitting of water data to a remote source, and remotely turning the water control valve on and off, etc.**]<br><br>https://muellersystems.com/<br>https://muellersystems.com/420-remote-disconnect-meter-rdm/ |
| b) one or more flow rate sensors connected to the water supply line and designed to monitor at least one of a water use data, a water energy use data, a water quality data, or a leak detection information, or any combination thereof, from the building or the structure, the one or more flow rate sensors connected with the electrical circuitry; | The Mueller 420 RDM and SSM has one or more flow rate sensors, said water supply and electrically connected with said electrical circuitry; "**Water flows through dual strainers in the pilot valve assembly. Differential pressure provides the operating principal for the valve activation. Water flows through the meter's strainer where debris is screened out. The incoming water fills a known volume of the measuring chamber on one or the other side of a movable disc that separates the chamber into two sections. As water enters, it moves the disc (nutates), forcing a known volume of water out of the meter from the opposite side of the disc. The process repeats as the sections refill and empty in turn.** |

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| | **The nutating action of the disc is coupled magnetically to the register to indicate the volume of water that passes through the meter.**" (Exhibit 5 at Bates No. MUE000000119 and MUE000000122).<br><br>"**As water enters, it moves the disc (nutates), forcing a known volume of water out of the meter from the opposite side of the disc. The process repeats as the sections refill and empty in turn. The nutating action of the disc is coupled magnetically to the register to indicate the volume of water that passes through the meter.**" (Exhibit 8 at Bates No. RT009383).<br><br>"**420 RDM Diaphragm Back Plate**, **RDM Section Cuts**" (Exhibit 22 at Bastes No. MUE000000001 to MUE000000002).<br><br>"**Mueller Systems® Solid State Meter (SSM) provides outstanding low flow accuracy down to 0.05 GPM and is available in 5/8" X 3/4" through 2" sizes. The meters provide 8-digit visual and electronic resolution for billing granularity and leak detection required with the latest AMR/AMI system technology in standard encoder protocol, with a choice of 0.1 standard gallons or 0.01 cubic toot resolution. All meters are available with a choice of 18" Nicor connectors or 5' flying lead wires for connection to Mueller Systems' migratable AMR/AMI solutions. The meter's lack of moving parts ensures that the original granular accuracy will be maintained over the 20-year life of the meter. The meter total, rate of flow, backflow indicator, temperature and other data is all available visually at the meter. Electronic output includes the meter serial number and the total. The SSM meter utilizes a low-lead bronze body on the 5/8" X 3/4" through 1" sizes and a stainless-steel body on the 1" and 2" sizes. A composite measuring tube, sensors and reflectors utilize an 0-ring seal for robust construction. The display is enclosed in a polymer enclosure with heat treated glass lend combined with the body to prohibit tampering.**" (Exhibit 21 Bates No. MUE000000351).<br><br>https://muellersystems.com/<br>https://muellersystems.com/420-remote-disconnect-meter-rdm |

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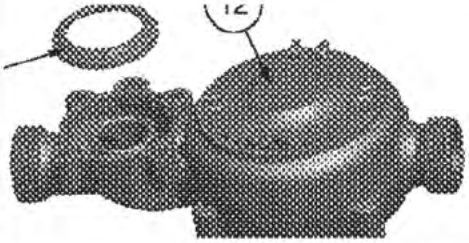
| |  <br>(Exhibit 5 at Bates No. MUE000000121)<br><br>"**To show with the work instruction, how to disassemble a HYDRUS (Diehl ultrasonic SSN Meter) and what are the different materials as a result of it.**" (Exhibit 20 at Bates No MUE000000125 to MUE000000330).<br><br>https://muellersystems.com/<br>https://muellersystems.com/420-remote-disconnect-meter-rdm/ |
| c) a power source that is at least one or an AC powered, a DC powered, or a one or more standard or rechargeable batteries, or any combination thereof, the rechargeable batteries capable of being supplemented with a turbine or other rotational mechanism that generates electrical energy, the power source is electrically connected to the electrical circuitry; | The Mueller 420 RDM and SSN has at least one of an AC power source, DC power source, and one or more standard or rechargeable batteries capable of being supplemented with a turbine or other rotational mechanism that generates electrical energy; "**coated electronic board and Power Source D Cell Lithium Battery**" (Exhibit 1 at Bates No. RT009366 and Exhibit 2 at Bates No. RT009368).<br><br>the power source is electrically connected to said electrical circuitry**; 20 Year Battery Life**" (Exhibit 3 at Bates No RT009371). "**Battery lifetime up to 20 years**" (Exhibit 20 at Bates No. MUE000000148). |

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| | <br>(Exhibit 13 at Bates No. MUE000000007)<br><br>https://muellersystems.com/<br>https://muellersystems.com/420-remote-disconnect-meter-rdm/ |
| d) one or more wireless communication technologies comprising at least one of a LoRa, a Sigfox, an U1tra Narrow Band (UNB), a 6LoWPAN, a WiMAX, a NB-IoT, a 3GPP cellular, a 4G/LTE-M cellular, or a 5G cellular technology, or any combination thereof; | The Mueller 420 RDM and SSM, with LoRaWAN (LW) Node or Cellular Node, utilizing Mi.Net®, wherein said one or more wireless communication technologies comprising at least one of a LoRa, Sigfox, Ultra Narrow Band, 6LowPAN., NB-IoT, LTE-M cellular, and 5G cellular technology;<br><br> <br><br>(Exhibit 2 at Bates No. RT009368)<br><br>"**Transmit Frequency 902 MHz to 928 MHz**" (Exhibit 1 at Bates No. RT009366).<br><br>"**Mueller Systems delivers the water industry's first LoRaWAN Class B smart water meter interface unit with the new Mi.Net Node. Bringing the power of two-** |

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| | **way communication between the node and the network down to the seconds, Mueller Mi.Net LoRaWAN (LW) node is truly a game-changer in defining the digital future of our cities.**" (Exhibit 3 at Bates No. RT009371).<br><br>"**Implemented with LoRaWAN Class B specification mode, the Mi.Net LW Node is the only solution in the water metering industry right now that delivers the fastest two-way wireless communication with an unparalleled level of flexibility for long term deployment – all without shortening its battery lifespan. It permits on-demand data to be collected and transmitted remotely within seconds. Besides consumption data, alerts such as leak detection, no flow, reverse flow and register tampering are constantly monitored.**" (Exhibit 4 at Bates No. RT009375).<br><br>"**The Mi.Net system employs LoRa technology. LoRa, short for "low power, long range," is an RF modulation technique that offers high-power transmissions and increased range over traditional systems with lower battery usage.**" (Exhibit 10 at Bates No. RT009395).<br><br> <br><br>(Exhibit 12 at Bates No. RT009402)<br><br>"**The Mueller Cellular Node allows water utilities to connect meters to their AMI network where radio communication is not feasible or cost effective.**" (Exhibit 12, at Bates No. RT009400).<br><br>https://muellersystems.com/<br>https://muellersystems.com/420-remote-disconnect-meter-rdm/ |

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| e) wherein the one or more wireless communication technologies utilizes authentication and encryption technologies for pairing operations and to prevent unauthorized access to a water data or information; and | The Mueller 420 RDM and SSM, with LoRaWAN (LW) Node or Cellular Node, utilizing Mi.Net® wireless communication technologies utilizes authentication and encryption technologies for pairing operations and to prevent unauthorized access to the water data or information: "**Security - LoRaWAN employs two layers of strict security measures. With network security, it ensures authenticity of the node in the network, while the application layer of the security ensures the network operator does not have access to the end user's application data.**" Exhibit 2 at Bates No. RT009369).<br><br>"**Security - LoRaWAN by design is very secure – authentication and encryption are, in fact, mandatory. With two session keys, the Network Session Key (NwkSKey) and Application key (APPSKey) to prevent spoofing and eavesdropping.**" (Exhibit 3 at Bates No. RT009371).<br><br>"[redacted]." (Exhibit 16 at Bates No. MUE000000055).<br><br>"[redacted]." (Exhibit 16 at Bates No. MUE000000055).<br><br>"[redacted]" (Exhibit 17 MUE000000078).<br><br>"[redacted] |

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| | [redacted] ” (Exhibit 14 at Bates No. MUE000000045).<br><br>https://muellersystems.com/, https://muellersystems.com/420-remote-disconnect-meter-rdm/ |
| f) wherein the one or more wireless communication technologies comprising at least one of the LoRa, the Sigfox, the Ultra Narrow Band (UNB), the 6LoWPAN, the WiMAX, the NB-IoT, the 3GPP cellular, the 4G/LTE-M cellular, or the 5G cellular technology, or any combination thereof, consists of a duplex technology to transmit the water use data, the water energy use data, the water quality data, or the leak detection information, or any combination thereof, and send commands to regulate the water control valve mechanism; | The Mueller 420 RDM and SSM, with LoRaWAN (LW) Node or Cellular Node, utilizing Mi.Net® with wireless communication technologies at least one of the LoRa, the Sigfox, the Ultra Narrow Band (UNB), the 6LoWPAN, the WiMAX, the NB-IoT, the 3GPP cellular, the 4G/LTE-M cellular, or the 5G cellular technology.<br>**“Leveraging Internet of Things (IoT) technologies, municipalities are transforming their water networks into open standards-based systems, improving service offered to customers, and enhancing the connectivity of a wide range of city services.**<br>**As a member of the LoRa Alliance, Mueller Systems is bringing IoT technology to water infrastructure through the Mi.Net® system. Other members of the alliance include multinational telecommunication companies, equipment manufacturers, system integrators, sensor manufacturers, and entrepreneurial start-ups.”** (Exhibit 10 at Bates No. RT009395). |

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| | <br><br>(Exhibit 2 at Bates No. RT009368)<br><br>"**Transmit Frequency 902 MHz to 928 MHz.**" "**The Mi.Net LW node is designed to provide features specifically needed to support low cost, secure bidirectional communications for IoT, including Smart City applications.**" (Exhibit 1 at Bates No. RT009366).<br><br>"**Mueller Systems delivers the water industry's first LoRaWAN Class B smart water meter interface unit with the new Mi.Net Node. Bringing the power of two-way communication between the node and the network down to the seconds, Mueller Mi.Net LoRaWAN (LW) node is truly a game-changer in defining the digital future of our cities.**" (Exhibit 3 at Bates No. RT009371).<br><br>"**Implemented with LoRaWAN Class B specification mode, the Mi.Net LW Node is the only solution in the water metering industry right now that delivers the fastest two-way wireless communication with an unparalleled level of flexibility for long term deployment – all without shortening its battery lifespan. It permits on-demand data to be collected and transmitted remotely within seconds. Besides consumption data, alerts such as leak detection, no flow, reverse flow and register tampering are constantly monitored.**" (Exhibit 4 at Bates No. RT009375).<br><br>"**The Mi.Net system employs LoRa technology. LoRa, short for "low power, long range," is an RF modulation technique that offers high-power transmissions and increased range over traditional** |

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| | **systems with lower battery usage.**" (Exhibit 10 at Bates No. RT009395).<br><br> <br><br>(Exhibit 12 at Bates No. RT009402)<br><br>"**The Mueller Cellular Node allows water utilities to connect meters to their AMI network where radio communication is not feasible or cost effective.**" (Exhibit 12, at Bates No. RT009400).<br><br>"**True two-way, command and control functionality**" **(**Exhibit 10 at Bates No. RT009387) to both receive at least one of a water use data, water energy use data, water quality data and leak detection information, "**Deliver enhanced services through a customer portal**" [duplex refers to two-way control] (Exhibit 10 at Bates No. RT009392).<br><br>"**The Mi.Net data portal improves your service and conservation efforts an online view of their water usage using a personal computer or mobile app. The interactive portal graphically present real-time and historical usage data collected by the Mi.Net system enabling customers to: monitor water usage, configure individual alerts, identify inconsistencies that may indicate the presence of leaks.**" (Exhibit 10 at Bates No. RT009393)<br><br>and send commands to regulate the control valve mechanism, "**Bringing the power of two-way communication between the node and the network down to seconds.**" "**Remote Disconnect Enabled Compatibility - Compatible with Mueller System 420 RDM, water utilities can remotely initiate a command to turn a water service on or off.**" (Exhibit 3 at Bates No. RT009371). |

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| | "**The MiNet LW node has the built-in capability to seamlessly connect with Mueller Systems Model 420 RDM (Remote Disconnect Meter) that allows easy and secure remote valve actuation to turn water service on and off.**" (Exhibit 4 at RT009376).<br><br>"**The pilot valve can be actuated vis the User Interface from any web enabled device with the proper log in and password. System screens indicate the position of the valve (open or closed) and record the date and time for all valve activations providing a permanent record of each account's history.**" (Exhibit 5 at Bate No. MUE000000119 and MUE000000122).<br><br>https://muellersystems.com/420-remote-disconnect-meter-rdm/<br>https://muellersystems.com/network-operations-center/ |
| the CPU, the microprocessor, or the microcontroller, or any combination thereof, includes at least one of a programming setting managed by a user to remotely set a mode setting or modify a default setting processed by a manufacturer to: | The Mueller 420 RDM and SSM, with LoRaWAN (LW) Node or Cellular Node has a CPU, microprocessor or microcontroller can at least include one of a programming setting managed by the user, remotely a mode setting, and a default or restricted setting processed by the manufacturing factory to: |
| a) record a water flow event to an integrated memory bank or a removable memory device for analysis; | "**Information retrieved from a water meter is stored temporarily with the node's non-volatile internal memory. As a default, the Mi.Net LW node will transmit hourly meter data at a predetermined time once per day to the network. On demand reads can been requested at any point in time and are typically delivered within seconds. The Mi.Net LW node is designed to provide features specifically needed to support low cost, secure bidirectional communications for IoT, including Smart City applications.**" "**Logs and stores 511 days of hourly data meter data in internal memory**" (Exhibit 1 at Bates No. RT009366).<br><br>"**2MB Solid-state Flash Memory for dedicated storage of readings**" (Exhibit 11 at Bates No. MUE000000341 and MUE000000345).<br><br>"[redacted] |

[redacted]." (Exhibit 20 at Bates No. MUE000000176).

"**Network Operations Center**" (Exhibit 7 at Bates No. RT009377 and Exhibit 10 at Bates No. RT009394).

(Exhibit 10 at Bates No. RT009389)

(Exhibit 7 at Bates No. RT009377)

"**The Mueller Systems Network Operations Center (NOC) based in the United States monitors water infrastructure for utilities across North America. The NOC is staffed by highly skilled analysts, each responsible for a specific group of Mi.Net customers. Proactively monitoring real-time network performance on the NOC's nine-foot-high command screen, our analysts immediately alert you if they detect an anomaly — enabling quick resolutions to problems, and a highly optimized network. Freeing your utility staff from monitoring network data enables focusing on your core utility activities,**

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| | **improving your infrastructure efficiency, and boosting your return on investment**." (Exhibit 10 at RT009394).<br><br>https://muellersystems.com/<br>https://muellersystems.com/420-remote-disconnect-meter-rdm/<br>https://muellersystems.com/network-operations-center/ |
| b) combine a plurality of water flow events into the integrated memory bank and subsequently schedule the transfer of the water flow events to a one or more remote computers or servers or to a cloud computing company; | "**Information retrieved from a water meter is stored temporarily with the node's non-volatile internal memory**" "**Logs and stores 511 days of hourly data meter data in internal memory**" (Exhibit 1 at Bates No. RT009366).<br><br>"**2MB Solid-state Flash Memory for dedicated storage of readings**" (Exhibit 11 at Bates No. MUE000000341 and MUE000000345).<br><br>"[redacted]." (Exhibit 20 at Bates No. MUE000000176).<br><br>"**The node transmits water meter data to the LoRaWAN network daily, via an unlicensed radio frequency.**" (Exhibit 2 at Bates No. RT009368).<br><br>https://muellersystems.com/<br>https://muellersystems.com/420-remote-disconnect-meter-rdm/ |
| c) transfer the water flow event to the one or more remote computers or servers or to the cloud computing company; | "**Transmit Frequency 902 MHz to 928 MHz**" (Exhibit 1 at Bates No. RT009366).<br><br>"**Mueller Systems delivers the water industry's first LoRaWAN Class B smart water meter interface unit with the new Mi.Net Node. Bringing the power of two-way communication between the node and the network down to the seconds, Mueller Mi.Net LoRaWAN (LW) node is truly a game-changer in defining the digital future of our cities.**" (Exhibit 3 at Bates No. RT009371).<br><br>"**Enhanced Security: Mueller has implemented security measures to provide data protection on the user interface, critical field devices, and utility IT data** |

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| | **systems. Amazon Web Service (AWS) provides an added level of protection of the utility, homeowner and business data.**" (Exhibit 12 at Bates No. RT009400). |
| d) transfer the water data or information utilizing a blockchain technology to the one or more remote computers or servers or to the cloud computing company; | N/A |
| e) modify water units or timing units; | Unknown |
| f) establish alarm set points; | "**Configure individual alerts**" (Exhibit 10 at Bates No. RT009393). |
| or any combination thereof; and | |
| the one or more wireless communication technologies configured to: | |
| (i) transmit at least one of the water use data, the water energy use data, the water quality data, or the leak detection information, or any combination thereof, to the one or more remote computers or servers or to the cloud computing company; and | "**The node transmits water meter data to the LoRaWAN network daily, via an unlicensed radio frequency.**" (Exhibit 2 at RT009368).<br><br>"**Implemented with LoRaWAN Class B specification mode, the Mi.Net LW Node is the only solution in the water metering industry right now that delivers the fastest two-way wireless communication with an unparalleled level of flexibility for long term deployment – all without shortening its battery lifespan. It permits on-demand data to be collected and transmitted remotely within seconds. Besides consumption data, alerts such as leak detection, no flow, reverse flow and register tampering are constantly monitored.**" (Exhibit 4 at RT009375).<br><br>"**Deliver enhanced services through a customer portal**" (Exhibit 10 at Bates No. RT009392). |
| (ii) receive an instruction or signal to command the management of the water control valve mechanism or perform another command operation; | "**REMOTE DISCONNECT ENABLED COMPATIBILITY - Eliminate the need for truck rolls; the node is compatible with Mueller Systems 420RDM. Utilities can remotely initiate a command to turn water service on or off.**" (Exhibit 2 at Bates No. RT009369).<br><br>"**Remote Disconnect Enabled Compatibility**"<br>"**Compatible with Mueller System 420 RDM, water utilities can remotely initiate a command to turn a water service on or off.**" (Exhibit 3 at Bates No. RT009371). |

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| | "**The Mi.Net LW node has the built-in capability to seamlessly connect with Mueller Systems Model 420 RDM (Remote Disconnect Meter) that allows easy and secure remote valve actuation to turn water service on or off.**" (Exhibit 4 at Bates No. RT009376).<br><br>https://muellersystems.com/<br>https://muellersystems.com/420-remote-disconnect-meter-rdm/ |
| using at least one of an Internet connection, a private network system, or a corporate owned network system that communicates with a smart phone, a computer, a server, a tablet, a web portal, or another electronic communication device. | The Mueller 420 RDM and SSM, with LoRaWAN (LW) Node or Cellular Node, utilizing Mi.Net®, "**The node transmits water meter data to the LoRaWAN network daily via a unlicensed radio frequency.**" (Exhibit 2 at Bates No. RT009368).<br><br>"**Implemented with LoRaWAN Class B specification mode, the Mi.Net LW Node is the only solution in the water metering industry right now that delivers the fastest two-way wireless communication with an unparalleled level of flexibility for long term deployment – all without shortening its battery lifespan. It permits on-demand data to be collected and transmitted remotely within seconds. Besides consumption data, alerts such as leak detection, no flow, reverse flow and register tampering are constantly monitored.**" (Exhibit 4 at Bates No. RT009375).<br><br>"**Deliver enhanced services through a customer portal**" (Exhibit 10 at Bates No. RT009392). |
| '837 Patent Claim 45 | |
| 45. A water meter and leak detection system as recited in claim 42, further comprising one or more communication hubs in wired communication with the base station or having a wireless communication technology corresponding with the one or more wireless communication technologies of the base station, wherein the one or more communication hubs transfers the water use data, the water energy use data, the water quality data, or the leak detection information, or any | The Mueller 420 RDM and SSM, with LoRaWAN (LW) Node or Cellular Node, utilizing Mi.Net® is a water meter and leak detection system: "**The Mi.Net system employs LoRa technology. LoRa, short for "low power, long range," is an RF modulation technique that offers high-power transmissions and increased range over traditional systems with lower battery usage.**" (Exhibit 10 at Bates No. RT009395).<br><br>"**Mi.Net Fixed Network Collector -**<br>**Mueller Systems Mi.Net Fixed Network Collector enables efficient, robust data acquisition across the Mi.Net Mueller Infrastructure Network for utilities by supporting long range wireless communications from** |

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| combination thereof, to at least one of the Internet connection, the private network system, or the corporate owned network system that communicates with company the one or more remote computers or servers or with the cloud computing company.<br>. | **originating Nodes to the utility's Mi.Host software platform. The device's wide range provides an extended coverage area and dramatically reduces system cost and maintenance. Each collector is monitored by the Mueller Network Operations Center (NOC) to ensure that your network is running at maximum efficiency. In addition, each collector is field serviceable. allowing a service technician to easily upgrade or repair a unit with minimal downtime.** (Exhibit 21 at Bates No. MUE000000351).<br><br>**The fixed network collector enables full two-way radio frequency (RF) communication between water meters equipped with encoder registers. Radio transceivers and the Mi.Host software application. Collectors are equipped with a large army of non-volatile memory in addition to 511 days of hourly data stored in each node. This capacity results in resilient communications a robust network and peace of mind for the user. A variety of options for collector communication are available, while wired network connections (Ethernet, fiber, DSL), wireless cellular or any existing network infrastructure are supported to fully utilize available utility assets to communicate to users. Mi.Hub communications are heavily encrypted (AES 256-bit) to ensure security and guard against theft or corruption of data.**" (Exhibit 21 at Bates No. MUE000000351).<br><br>"**Two Way Mi.Net Mobile Transceiver - The latest Mueller Systems vehicle-based, two-way communication solution is the Mi.Net Mobile is enclosed in a polymer Transceiver, providing full two-way communication enclosure with heat-treated to all Mi.Net M endpoint-equipped meter products. glass lens combined with The Mobile Transceiver is also capable of one-way the body to prohibit reception from all legacy Hot Rod transmitters to tampering. Provide a migration path for continued mobile meter reading as your AMR system expands.**" (Exhibit 21 at Bates No. MUE00000351).<br><br>"**The node transmits water meter data to the LoRaWAN network daily, via an unlicensed radio frequency.**" (Exhibit 2 at RT009368). |

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| | "**Implemented with LoRaWAN Class B specification mode, the Mi.Net LW Node is the only solution in the water metering industry right now that delivers the fastest two-way wireless communication with an unparalleled level of flexibility for long term deployment – all without shortening its battery lifespan. It permits on-demand data to be collected and transmitted remotely within seconds. Besides consumption data, alerts such as leak detection, no flow, reverse flow and register tampering are constantly monitored.**" (Exhibit 4 at Bates No. RT009375).<br><br>"**Deliver enhanced services through a customer portal**" (Exhibit 10 at Bates No. RT009392).<br><br>"**Information retrieved from a water meter is stored temporarily with the node's non-volatile internal memory. As a default, the Mi.Net LW node will transmit hourly meter data at a predetermined time once per day to the network. On demand reads can been requested at any point in time and are typically delivered within seconds. The Mi.Net LW node is designed to provide features specifically needed to support low cost, secure bidirectional communications for IoT, including Smart City applications.**" "**Logs and stores 511 days of hourly data meter data in internal memory**" (Exhibit 1 at Bates No. RT009366).<br><br>"**Network Operations Center**" (Exhibit 7 at Bates No. RT009377 and Exhibit 10 at Bates No. RT009394).<br><br>"**Enhanced Security: Mueller has implemented security measures to provide data protection on the user interface, critical field devices, and utility IT data systems. Amazon Web Service (AWS) provides an added level of protection of the utility, homeowner and business data.**" (Exhibit 12 at Bates No. RT009400). |

(Exhibit 10 at RT009389)

(Exhibit 7 at RT009377)

"**The Mueller Systems Network Operations Center (NOC) based in the United States monitors water infrastructure for utilities across North America. The NOC is staffed by highly skilled analysts, each responsible for a specific group of Mi.Net customers. Proactively monitoring real-time network performance on the NOC's nine-foot-high command screen, our analysts immediately alert you if they detect an anomaly — enabling quick resolutions to problems, and a highly optimized network. Freeing your utility staff from monitoring network data enables focusing on your core utility activities, improving your infrastructure efficiency, and boosting your return on investment.**" (Exhibit 10 at Bates No. RT009394).

"**Network Operations Center**" (Exhibit 7 at Bates No. RT009377 and Exhibit 10 at Bates No. RT009394).

| '837 Patent Claim 47 | |
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| 47. A water meter and leak detection system as recited in claim 42, wherein an owner or the user communicates with at least one of the smart phone, the computer, the server, the tablet, the web portal, or the other electronic communication device that includes a software program displaying an icon, a menu, or a submenu that provides at least one function of: | The Mueller 420 RDM and SSM, with LoRaWAN (LW) Node or Cellular Node, utilizing Mi.Net® is a water meter and leak detection system: Owner or user can communicate with at least one of a smart phone, computer, server, tablet, web portal and one or more other electronic communication devices that includes a software program application capable of displaying an icon, menu, or submenu at least one function of:<br> <br>(Exhibit 10 at Bates No. RT009393) |
| (a) providing a graphical display of at least one of the water use data, the water energy use data, or the water quality data, or any combination thereof, from a selected water fixture or a water appliance, the water data or information transferred from at least one of the base station, a remote central computer, or the cloud computing company; | "**Deliver enhanced service through a customer portal**" "**The Mi.Net data portal improves your service and conservation efforts an online view of their water usage using a personal computer or mobile app. The interactive portal graphically present real-time and historical usage data collected by the Mi.Net system enabling customers to: monitor water usage, configure individual alerts, identify inconsistencies that may indicate the presence of leaks.**" (Exhibit 10 at Bates No. RT009393). |
| (b) displaying an alarm condition based on one of the water use data, the water energy use data, or the water quality data, or any combination thereof, and programmed into the base station; | "**The Mi.Net data portal improves your service and conservation efforts an online view of their water usage using a personal computer or mobile app. The interactive portal graphically present real-time and historical usage data collected by the Mi.Net system enabling customers to: monitor water usage, configure individual alerts, identify inconsistencies that may indicate the presence of leaks.**" (Exhibit 10 at Bates No. RT009393). |
| (c) turning on or off a water supply by sending a command signal to the base station; | "**REMOTE DISCONNECT ENABLED COMPATIBILITY - Eliminate the need for truck rolls; the node is compatible with Mueller Systems 420RDM. Utilities can remotely initiate a command to turn water service on or off.**" (Exhibit 2 at RT009369). |

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| | "**Remote Disconnect Enabled Compatibility**" "**Compatible with Mueller System 420 RDM, water utilities can remotely initiate a command to turn a water service on or off.**" (Exhibit 3 at Bates No. RT009371).<br><br>"**The Mi.Net LW node has the built-in capability to seamlessly connect with Mueller Systems Model 420 RDM (Remote Disconnect Meter) that allows easy and secure remote valve actuation to turn water service on or off.**" (Exhibit 4 at Bates No. RT009376). |
| (d) showing or modifying the software program, a setting, or a default menu included within the base station; | "**Mueller proprietary firmware allows the Mi.Net LW node to be upgraded autonomously, The Mi.Net system integrated with the Mi.Net LW node can be scheduled for an upgrade at one time and the system will notify the user when the process is complete.**" (Exhibit 1 Bates No. RT009366).<br><br>"[redacted]" (Exhibit 19 at Bates No. MUE00000080). |
| (e) identifying an operational position of the water control valve mechanism by sending a request to the base station; | (a), (b), (c), (d), and (f) correspond with "at least one function of" |
| (f) downloading updates or regional water rates into the base station; or | "**Mueller proprietary firmware allows the Mi.Net LW node to be upgraded autonomously, The Mi.Net system integrated with the Mi.Net LW node can be scheduled for an upgrade at one time and the system will notify the user when the process is complete.**" (Exhibit 1 Bates No. RT009366).<br><br>"[redacted]" |

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| | [redacted]" (Exhibit 19 at Bates No. MUE00000080). |
| (g) programming a vacation or work water schedule into the base station. | (a), (b), (c), (d), and (f) correspond with "at least one function of" |
| '837 Patent Claim 48 | |
| 48. A water meter and leak detection system as recited in claim 45, wherein the base station includes at least one of a mesh or a peer-to-peer technology circuitry that communicates with a one or more base stations or the one or more communication hubs. | The Mueller 420 RDM and SSM, with LoRaWAN (LW) Node or Cellular Node, utilizing Mi.Net® is a water meter and leak detection system: One of collection nodes are capable of including at least one of a mesh and/or and peer-to-peer technology circuitry that can communicate with at least one of another water meter collection nodes and communication hubs, "**The node transmits water meter data to the LoRaWAN network daily, via an unlicensed radio frequency.**" (Exhibit 2 at Bates No. RT009368).<br><br>"**Implemented with LoRaWAN Class B specification mode, the Mi.Net LW Node is the only solution in the water metering industry right now that delivers the fastest two-way wireless communication with an unparalleled level of flexibility for long term deployment – all without shortening its battery lifespan. It permits on-demand data to be collected and transmitted remotely within seconds. Besides consumption data, alerts such as leak detection, no flow, reverse flow and register tampering are constantly monitored.**" (Exhibit 4 at Bates No. RT009375).<br><br>"**The document specifies the Mi.Mesh protocol stack. This document details the precise mechanisms and message formats used to convey data reliably between two devices equipped with the radio modules. Flow diagrams, message format definitions, and transaction examples give a complete definition of the protocol as it appears over the air and in system memory.**" (Exhibit 14 at Bates No. MUE000000043).<br><br>"[redacted] |

[redacted]" (Exhibit 14 at Bates No. MUE000000043).

"[redacted]" (Exhibit 14 at Bates No. MUE000000045).

"**The Mi.Net system employs LoRa technology. LoRa, short for "low power, long range," is an RF modulation technique that offers high-power transmissions and increased range over traditional systems with lower battery usage.**" (Exhibit 10 at Bates No. RT009395).

"**Mi.Net Fixed Network Collector - Mueller Systems® Mi.Net Fixed Network Collector enables efficient, robust data acquisition across the Mi.Net Mueller Infrastructure Network for utilities by supporting long range wireless communications from originating Nodes to the utility's Mi.Host software platform. The device's wide range provides an extended coverage area and dramatically reduces system cost and maintenance. Each collector is monitored by the Mueller Network Operations Center (NOC) to ensure that your network is running at maximum efficiency. In addition, each collector is field serviceable. allowing a service technician to easily upgrade or repair a unit with minimal downtime.**" (Exhibit 21 at Bates No.

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| | MUE000000351).<br><br>"**The fixed network collector enables full two-way radio frequency (RF) communication between water meters equipped with encoder registers. Radio transceivers and the Mi.Host software application. Collectors are equipped with a large army of non-volatile memory in addition to 511 days of hourly data stored in each node. This capacity results in resilient communications a robust network and peace of mind for the user. A variety of options for collector communication are available, while wired network connections (Ethernet, fiber, DSL), wireless cellular or any existing network infrastructure are supported to fully utilize available utility assets to communicate to users. Mi.Hub communications are heavily encrypted (AES 256-bit) to ensure security and guard against theft or corruption of data.**" (Exhibit 21 at Bates No. MUE000000351).<br><br>"**Two Way Mi.Net Mobile Transceiver - The latest Mueller Systems vehicle-based, two-way communication solution is the Mi.Net Mobile is enclosed in a polymer Transceiver, providing full two-way communication enclosure with heat-treated to all Mi.Net M endpoint-equipped meter products. glass lens combined with The Mobile Transceiver is also capable of one-way the body to prohibit reception from all legacy Hot Rod transmitters to tampering. Provide a migration path for continued mobile meter reading as your AMR system expands.**" (Exhibit 21 at Bates No. MUE00000351).<br><br>https://muellersystems.com/<br>https://muellersystems.com/420-remote-disconnect-meter-rdm/ |
| '837 Patent Claim 49 | |
| 49. A water meter and leak detection system as recited in claim 45, wherein the one or more communication hubs includes at least one of a mesh or a peer-to-peer technology circuitry that communicates with a one or more base stations. | The Mueller 420 RDM and SSM, with LoRaWAN (LW) Node or Cellular Node, utilizing Mi.Net® is a water meter and leak detection system: One of more communication hubs can include at least one of a mesh and/or and peer-to-peer technology circuitry that can communicate with at least one of another water meter collection nodes and communication hubs, "**PURPOSE - This document specifies the Mi.Mesh protocol stack. This document details the precise mechanisms and message formats** |

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| | **used to convey data reliably between two devices equipped with the radio modules. Flow diagrams, message format definitions, and transaction examples give a complete definition of the protocol as it appears over the air and in system memory.**" (Exhibit 14 at Bates No. MUE000000043).<br><br>"[redacted]" (Exhibit 14 at Bates No. MUE000000043).<br><br>"[redacted]" (Exhibit 16 at Bates No. MUE000000055).<br><br>https://muellersystems.com/<br>https://muellersystems.com/420-remote-disconnect-meter-rdm/ |

# EXHIBIT N

**EXHIBIT 2**

Mueller's Response to Rein Tech's Request for Interrogatories

**RESTRICTED - ATTORNEYS' EYES ONLY**

**IN THE UNITED STATES DISTRICT COURT**
**FOR THE DISTRICT OF DELAWARE**

| | |
|---|---|
| **REIN TECH, INC.,**<br>**Plaintiff,**<br>**v.**<br>**MUELLER SYSTEMS, LLC,**<br>**Defendant.** | **No. 1:18-cv-01683-MN** |

**DEFENDANT'S RESPONSES TO PLAINTIFF'S INTERROGATORIES (1-25)**

Pursuant to Rules 26 and 33 of the Federal Rules of Civil Procedure, Mueller Systems, LLC ("Mueller" or "Defendant") hereby serves its responses to Plaintiff Rein Tech, Inc.'s ("Rein Tech" or "Plaintiff") Interrogatories (1-25) ("Interrogatories").

## PRELIMINARY STATEMENT

1. Mueller has responded to the Interrogatories as it interprets and understands them. If Rein Tech subsequently asserts an interpretation of any interrogatory that differs from Mueller's understanding, Mueller reserves the right to supplement or amend its objections and/or responses.

2. The responses set forth herein are based on information presently available to Mueller following a diligent search, reasonable in scope, for information in its possession, custody or control. Mueller reserves the right to complete its investigation and discovery of the facts, and to rely at trial or in other proceedings on documents and information in addition to the information provided herein, regardless of whether such information is newly discovered or newly in existence.

3. In that regard, Mueller reserves the right to revise, amend, correct, supplement, modify or clarify its objections and responses in accordance with the Federal Rules of Civil

Procedure.

4. Mueller will not produce information protected from disclosure by the attorney-client privilege, the work product immunity and/or any other applicable privilege or immunity. Inadvertent disclosure of information that is privileged, prepared in anticipation of litigation or for trial, or otherwise immune from discovery, shall not constitute a waiver of any privilege or of any ground for objection to discovery with respect to such information, or the subject matter thereof or the information contained therein, or of the right of Mueller to object to the use of any such information during any subsequent proceeding.

5. Mueller has various documents and information in its possession, custody, or control that are subject to third-party confidentiality restrictions. If any information is withheld from disclosure on the basis of third-party confidentiality restrictions, Mueller will identify the third party, begin discussions with the third-party regarding disclosure of the information, and advise Rein Tech of its efforts relating to same.

6. Subject to the Federal Rules of Civil Procedure, Mueller's responses to the Interrogatories shall not constitute an admission by Mueller either that any Interrogatory or any response thereto is relevant to, or admissible as evidence in, any trial or other proceeding. All objections as to privilege, immunity, relevance, authenticity or admissibility of any information or documents referred to herein are expressly reserved. Unless otherwise indicated in a specific response, Mueller's responses to the Interrogatories are not a concession that any individual identified by Mueller will be called as a witness or that such person possesses discoverable information, or that the subject matter of the particular interrogatory is relevant to this action.

**SPECIFIC OBJECTIONS AND RESPONSES TO INTERROGATORIES (1-25)**

**INTERROGATORY NO. 1:**

Describe the process of submitting a plan, obtaining approval, installing the accused products, money revenue received, and costs agreed upon for contracted projects with third parties using the accused products since 2018.

**RESPONSE:**

Mueller objects to this Interrogatory to the extent it seeks information that is protected by the attorney-client privilege and/or by the work product immunity. Mueller further objects to this Interrogatory as overly broad and unduly burdensome as it seeks information not relevant to the subject matter involved in this litigation nor proportional to the needs of the case. Based on its objections and understanding of the Interrogatory, Mueller states that for LoRaWAN projects, prior to an award, Mueller receives a request for a quote for the cost of products and services to be provided. The request may include installation locations and quantities of Mueller LoRaWAN Nodes. Upon receiving the request, Mueller determines the number of units and personnel necessary for the project. [redacted] A quote is routed within Mueller for internal approvals and subsequently submitted to the potential customer. Upon notification of approval by the customer and award of the project, [redacted]. In addition, purchase orders are placed with Mueller's manufacturing department for the build of required nodes and services. During the material build process, firmware and security keys are installed within the nodes. The systems are then installed pursuant to specifications set forth in a contract. Payment is likewise

made pursuant to the specifications in the contract.

For cellular systems, the process is similar. However, before Mueller provides a quote, the [redacted] Further, Mueller has not yet completed its investigation and review of documents regarding this Interrogatory. Based on its objections and understanding of the Interrogatory, Mueller will identify relevant plans and related documents, if such documents exists, and reserves the right to produce documents pursuant to Rule 33(d). Mueller also reserves the right to supplement and/or change its response to this interrogatory as discovery and the case progress.

**INTERROGATORY NO. 2:**

Describe the number of LoRa and Cellular installations for contracted projects with third parties using the accused products since 2018.

**RESPONSE:**

Mueller objects to this Interrogatory to the extent it seeks information that is protected by the attorney-client privilege and/or by the work product immunity. Based on its objections and understanding of the Interrogatory, Mueller states that since 2018, it has approximately two pilot cellular installations and two LoRaWAN installations.

Mueller's response to this Interrogatory is made based on present knowledge, and its investigation and review of documents is ongoing. Mueller reserves the right to supplement and/or change its response as discovery and the case progress.

**INTERROGATORY NO. 3:**

Describe the LoRa and Cellular infrastructure and maintenance costs for contracted projects with third parties using the accused products since 2018.

**RESPONSE:**

Mueller objects to this Interrogatory to the extent it seeks information that is protected by the attorney-client privilege and/or by the work product immunity. Mueller further objects to this Interrogatory as overly broad and unduly burdensome as it seeks information not relevant to the subject matter involved in this litigation nor proportional to the needs of the case. Mueller further objects to this Interrogatory as ambiguous, as "costs" is not defined. Based on its objections and understanding of the Interrogatory, Mueller states that [redacted]. Further, Mueller has not yet completed its investigation and review of documents regarding this Interrogatory. Based on its objections and understanding of the Interrogatory, Mueller will identify relevant documents, if such documents exists, and reserves the right to produce documents pursuant to Rule 33(d). Mueller also reserves the right to supplement and/or change its response to this interrogatory as discovery and the case progress.

**INTERROGATORY NO. 4:**

Describe the MiNet and MiHub systems and their association with the accused products since 2018.

**RESPONSE:**

Mueller objects to this Interrogatory to the extent it seeks information that is protected by the attorney-client privilege and/or by the work product immunity. Mueller further objects to this Interrogatory as vague and unclear as it is not understood what is meant by "association with."

Subject to and without waiving its objections, Mueller responds as follows:

Mi.Hub has no association to the accused products. The Mi.Net Network has no

association to the accused products.

To the extent "MiNet system[]" refers to Mueller's backend software system and related infrastructure, the backend software comprises a server hosted by Amazon Web Services ("AWS") executing Mueller's proprietary Sentryx™ software for monitoring and control of nodes at remote locations. These nodes may include LoRaWAN or Cellular nodes, at least some of which may be connected to 420 Remote Disconnect Meters ("RDMs") at customer premises (420 RDM with a LoRaWAN or Cellular node referred to as a "420 RDM Node"). The Sentryx™ software is accessible by Mueller and certain customers (such as water utilities), who are assigned access credentials for monitoring end-user customer water data and, in at least some cases, controlling 420 RDM Nodes.

Information is securely transferred from 420 RDM Nodes to the Sentryx™ server and is made available to customers (such as water utilities) through a web interface, which may integrate with a customer's billing software. The Sentryx™ software provides powerful analytics, combining meter read data with information from Mueller's optional integrated acoustic leak detection and pressure monitoring solutions as well as third party data sources, such as sensors and control devices.

[redacted]

Mueller's response to this Interrogatory is made based on present knowledge, and its

investigation and review of documents is ongoing. Mueller reserves the right to supplement and/or change its response as discovery and the case progress.

**INTERROGATORY NO. 5:**

Describe when and how a residential user, corporate user, or water municipality is provided an alert of a water leak and what options are available for each of the residential user, corporate user, and water municipality upon alert of a leak.

**RESPONSE:**

Mueller objects to this Interrogatory to the extent it seeks information that is protected by the attorney-client privilege and/or by the work product immunity. Mueller further objects to this Interrogatory as vague and unclear as it is not understood what is meant by "options."

Subject to and without waiving its objections, Mueller responds as follows:

Water data is communicated by a 420 RDM Node to Mueller's backend Sentryx™ server. The Sentryx™ software detects leaks by analyzing the water data and generating associated alerts. The 420 RDM Node may generate an overflow alert in the event of a particularly high consumption of water within a certain interval of time. The overflow alert is communicated to the backend Sentryx™ server. Mueller personnel accessing the Sentryx™ server, as well as certain customers with credentials for accessing the Sentryx™ server, may send disconnect commands to the 420 RDM Node to cease the flow of water therethrough, for example, upon receipt of a leak or overflow alert.

Mueller's response to this Interrogatory is made based on present knowledge, and its investigation and review of documents is ongoing. Mueller reserves the right to supplement and/or change its response as discovery and the case progress.

**INTERROGATORY NO. 6:**

Describe all data related to the accused products that is stored, transmitted, or harbored by Amazon Web Services or other cloud computing companies.

**RESPONSE:**

Mueller objects to this Interrogatory to the extent it seeks information that is protected by the attorney-client privilege and/or by the work product immunity. Mueller further objects to this Interrogatory as overly broad and unduly burdensome be requesting a description of "all data" stored and related to the accused products. Mueller further objects to this Interrogatory as vague and ambiguous as it is not understood how "stored" data differs from "harbored" data.

Subject to and without waiving its objections, Mueller responds as follows:

[redacted]

Mueller's response to this Interrogatory is made based on present knowledge, and its investigation and review of documents is ongoing. Mueller reserves the right to supplement and/or change its response as discovery and the case progress.

**INTERROGATORY NO. 7:**

Describe where and how the water use data for all currently contracted water meter projects using the accused products are stored and how the data is used by a Network Operations Center or home residents.

**RESPONSE:**

Mueller objects to this Interrogatory to the extent it seeks information that is protected by the attorney-client privilege and/or by the work product immunity. Mueller further objects to this Interrogatory as vague and ambiguous as it is not understood what is meant by "how the data is used by a Network Operations Center or home residents."

Subject to and without waiving its objections, Mueller responds as follows:

Data for contracted projects using the accused products is stored on storage devices associated with the Sentryx™ server. [redacted]. The data stored on storage devices associated with the Sentryx™ server is used by Mueller personnel and customers with credentials for accessing the Sentryx™ server (such as various water utilities) to monitor water usage of various end-user customers in a locality and to control RDM Nodes by disconnecting water flow, for example, in the event of detection of certain alarm conditions.

Mueller's response to this Interrogatory is made based on present knowledge, and its investigation and review of documents is ongoing. Mueller reserves the right to supplement and/or change its response as discovery and the case progress.

**INTERROGATORY NO. 8:**

Describe the Sentryx system and algorithm, what they are, and how they are used with the accused products.

**RESPONSE:**

Mueller objects to this Interrogatory to the extent it seeks information that is protected by the attorney-client privilege and/or by the work product immunity. Mueller further objects to this Interrogatory as vague and ambiguous as it is not understood what is meant by "Describe the . . . algorithm."

Subject to and without waiving its objections, Mueller responds as follows:

Mueller's backend software comprises a server hosted by AWS executing Mueller's proprietary Sentryx™ software for monitoring and control of nodes at remote locations. These nodes may include 420 RDM Nodes at customers' premises. The Sentryx™ software is accessible by Mueller and certain customers (such as water utilities), who are assigned access credentials for monitoring end-user customer water data and, in at least some cases, controlling 420 RDM Nodes.

Information is securely transferred from 420 RDM Nodes to the Sentryx™ server and is made available to customers (such as water utilities) through a web interface, which may integrate with a customer's billing software. The Sentryx™ software provides powerful analytics, combining meter read data with information from Mueller's optional integrated acoustic leak detection and pressure monitoring solutions as well as third party data sources, such as sensors and control devices.

[redacted]

[redacted]

Water data is communicated by a 420 RDM Node to Mueller's backend Sentryx™ server. The Sentryx™ software detects leaks by analyzing the water data and generating associated alerts. The 420 RDM Node may generate an overflow alert in the event of a particularly high consumption of water within a certain interval of time. The overflow alert is communicated to the backend Sentryx™ server. Mueller personnel accessing the Sentryx™ server, as well as certain customers with credentials for accessing the Sentryx™ server, may send disconnect commands to the 420 RDM Node to cease the flow of water therethrough, for example, upon receipt of a leak or overflow alert.

[redacted]

Data for contracted projects using the accused products is stored on storage devices associated with the Sentryx™ server. [redacted] The data stored on storage devices associated with the Sentryx™

server is used by Mueller personnel and customers with credentials for accessing the Sentryx™ server (such as various water utilities) to monitor water usage of various end-user customers in a locality and to control RDM Nodes by disconnecting water flow, for example, in the event of detection of certain alarm conditions.

Mueller's response to this Interrogatory is made based on present knowledge, and its investigation and review of documents is ongoing. Mueller reserves the right to supplement and/or change its response as discovery and the case progress.

**INTERROGATORY NO. 9:**

Describe the number and percentage of solid-state water meters (SSMs) that are currently installed the field under contract with third parties that use wireless technology.

**RESPONSE:**

Mueller objects to this Interrogatory to the extent it seeks information that is protected by the attorney-client privilege and/or by the work product immunity. Mueller further objects to this Interrogatory as overly broad and unduly burdensome as it seeks information not relevant to the subject matter involved in this litigation nor proportional to the needs of the case. Mueller further objects to this Interrogatory as vague and ambiguous as it is not understood what is meant by "percentage of solid-state water meters (SSMs)" and, more specifically, to what measure the "percentage of solid-state water meters (SSMs)" is relative.

Subject to and without waiving its objections, Mueller responds as follows:

Mueller has not yet completed its investigation and review of documents regarding this Interrogatory. Based on its objections and understanding of the Interrogatory, Mueller will identify

relevant documents for the accused products, if such documents exist, and reserves the right to produce documents pursuant to Rule 33(d).

**INTERROGATORY NO. 10:**

Describe the number and percentage of SSM water meters using a control valve currently installed in the field under contract with third parties.

**RESPONSE:**

Mueller objects to this Interrogatory to the extent it seeks information that is protected by the attorney-client privilege and/or by the work product immunity. Mueller further objects to this Interrogatory as vague and ambiguous as it is not understood what is meant by "percentage of SSM water meters" and, more specifically, to what measure the "percentage of SSM water meters" is relative.

Subject to and without waiving its objections, Mueller responds as follows:

No SSM water meters currently installed in the field under contract with third parties use a control valve.

Mueller's response to this Interrogatory is made based on present knowledge, and its investigation and review of documents is ongoing. Mueller reserves the right to supplement and/or change its response as discovery and the case progress.

**INTERROGATORY NO. 11:**

Describe the options for wired or wireless communications, wireless LoRa, and Cellular networks using Mi.Net® Fixed Network Collectors with the accused products and any corporate network infrastructure using Mi.Net® Fixed Network Collectors with the accused products.

**RESPONSE:**

Mueller objects to this Interrogatory to the extent it seeks information that is protected by the attorney-client privilege and/or by the work product immunity. Mueller further objects to this Interrogatory as vague and ambiguous as it is not understood what is meant by "options for wired or wireless communications, wireless LoRa, and Cellular networks."

Mueller further objects to this Interrogatory as vague and ambiguous as it is not understood what is meant by "corporate network infrastructure." For example, does this refer to Mueller's network infrastructure? A third-party's network infrastructure? A customer's network infrastructure?

Subject to and without waiving its objections, Mueller responds as follows:

There are no options for wired or wireless communications, wireless LoRa, and Cellular networks using Mi.Net® Fixed Network Collectors with the accused products and any corporate network infrastructure using Mi.Net® Fixed Network Collectors with the accused products.

Mueller's response to this Interrogatory is made based on present knowledge, and its investigation and review of documents is ongoing. Mueller reserves the right to supplement and/or change its response as discovery and the case progress.

**INTERROGATORY NO. 12:**

Describe your marketing of the accused products including the use of sales literature, such as brochures, flyers, bulletins, advertisements, pamphlets, catalog entries, product announcements, product descriptions, and other similar documents.

**RESPONSE:**

Mueller objects to this Interrogatory to the extent it seeks information that is protected by the attorney-client privilege and/or by the work product immunity. Mueller further objects to this

Interrogatory as overly broad and unduly burdensome as it seeks information not relevant to the subject matter involved in this litigation nor proportional to the needs of the case as this Interrogatory would require Mueller to describe all marketing activities of Mueller's marketing department, which uses traditional marketing methods to market Mueller's products, including the accused devices. Subject to and without waiving its objections, Mueller responds as follows: Mueller's marketing methods include, but are not limited to, use of websites (e.g., https://muellersystems.com/ami-solutions/lorawan/ and https://muellersystems.com/ami-solutions/cellular-node/), brochures, datasheets, articles, press releases, and flyers. Further, Mueller has not yet completed its investigation and review of documents regarding this Interrogatory. Based on its objections and understanding of the Interrogatory, Mueller will identify relevant marketing documents, and reserves the right to produce documents pursuant to Rule 33(d). Mueller also reserves the right to supplement and/or change its response to this Interrogatory as discovery and the case progress.

**INTERROGATORY NO. 13:**

Describe your examinations, evaluations, analyses, or studies of the technology and features of the accused products in comparison to the technology and features offered by your competitors.

**RESPONSE:**

Mueller objects to this Interrogatory to the extent it seeks information that is protected by the attorney-client privilege and/or by the work product immunity. Mueller further objects to this Interrogatory as vague and ambiguous as it is not understood what is meant by "the technology

and features of the accused products in comparison to the technology and features offered by your competitors."

Subject to and without waiving its objections, Mueller responds as follows:

Mueller receives relevant industry publications and reports (e.g., an insight report from Bluefield Research) containing evaluations and analyses of technology and features offered by Mueller's competitors. Further, Mueller has not yet completed its investigation and review of documents regarding this Interrogatory. Based on its objections and understanding of the Interrogatory, Mueller will identify any relevant examinations, evaluations, analyses, or studies, if such documents exist, and reserves the right to produce documents pursuant to Rule 33(d). Mueller also reserves the right to supplement and/or change its response to this Interrogatory as discovery and the case progress.

**INTERROGATORY NO. 14:**

Describe your market assessments of the accused products, including market summaries, reviews, analyses, evaluations, studies, and comments including but not limited to market projections and market projection models, projected market penetration and market share studies, market surveys, focus group studies, customer satisfaction surveys, and competitive position analyses.

**RESPONSE:**

Mueller objects to this Interrogatory to the extent it seeks information that is protected by the attorney-client privilege and/or by the work product immunity. Mueller further objects to this Interrogatory as vague and ambiguous as it is not understood what is meant by "the technology

and features of the accused products in comparison to the technology and features offered by your competitors."

Subject to and without waiving its objections, Mueller responds as follows:

Mueller receives relevant industry publications and reports (e.g., an insight report from Bluefield Research) containing evaluations and analyses of technology and features offered by Mueller's competitors. Further, Mueller has not yet completed its investigation and review of documents regarding this Interrogatory. Based on its objections and understanding of the Interrogatory, Mueller will identify any relevant examinations, evaluations, analyses, or studies, if such documents exist, and reserves the right to produce documents pursuant to Rule 33(d). Mueller also reserves the right to supplement and/or change its response to this Interrogatory as discovery and the case progress.

**INTERROGATORY NO. 15:**

Describe your strategic plans and business plans for the accused products for competing against your competitors, including any identification, review, analysis, evaluation, assessment, study, and summary regarding your competitors' technologies that compete with the accused products.

**RESPONSE:**

Mueller objects to this Interrogatory to the extent it seeks information that is protected by the attorney-client privilege and/or by the work product immunity. Mueller further objects to this Interrogatory as vague and ambiguous as it is not understood what is meant by "the technology and features of the accused products in comparison to the technology and features offered by your competitors."

Subject to and without waiving its objections, Mueller responds as follows:

Mueller receives relevant industry publications and reports (e.g., an insight report from Bluefield Research) containing evaluations and analyses of technology and features offered by Mueller's competitors. Mueller generally considers such research when developing its strategic and business plans. Further, Mueller has not yet completed its investigation and review of documents regarding this Interrogatory. Based on its objections and understanding of the Interrogatory, Mueller will identify any relevant examinations, evaluations, analyses, or studies, if such documents exist, and reserves the right to produce documents pursuant to Rule 33(d). Mueller also reserves the right to supplement and/or change its response to this Interrogatory as discovery and the case progress.

**INTERROGATORY NO. 16:**

Describe your actual, forecasted, planned, and budgeted gross and net sales, gross and net profits, gross and net profit margins, and gross and net revenues for the accused products and all products and services that have been marketed, offered, and sold in connection with the accused products in and from the U.S. since October 27, 2021.

**RESPONSE:**

Mueller objects to this Interrogatory to the extent it seeks information that is protected by the attorney-client privilege and/or by the work product immunity. Mueller further objects to this Interrogatory as overly broad and unduly burdensome as it seeks information not relevant to the subject matter involved in this litigation nor proportional to the needs of the case as it would require Mueller to summarize numerous financial records and reports. Mueller further objects to this Interrogatory as vague and ambiguous as it is not understood what is meant by "the technology

and features of the accused products in comparison to the technology and features offered by your competitors."

Subject to and without waiving its objections, Mueller responds as follows:

Mueller has not yet completed its investigation and review of documents regarding this Interrogatory. Based on its objections and understanding of the Interrogatory, Mueller will identify relevant financial records and reports for the accused products, if such documents exist, and reserves the right to produce documents pursuant to Rule 33(d). Mueller also reserves the right to supplement and/or change its response to this Interrogatory as discovery and the case progress.

**INTERROGATORY NO. 17:**

Describe how you price the accused products and the individual products, technologies, and services that you offer in connection with the accused products, including any strategic analyses prepared in connection with setting the prices of the accused products and the perceived value of the individual products, technologies, and services offered in connection with the accused products.

**RESPONSE:**

Mueller objects to this Interrogatory to the extent it seeks information that is protected by the attorney-client privilege and/or by the work product immunity. Mueller further objects to this Interrogatory as overly broad and unduly burdensome as it seeks information not relevant to the subject matter involved in this litigation nor proportional to the needs of the case.

Subject to and without waiving its objections, Mueller responds as follows:

Mueller has not yet completed its investigation and review of documents regarding this Interrogatory. Based on its objections and understanding of the Interrogatory, Mueller will identify

relevant documents for the accused products, if such documents exist, and reserves the right to produce documents pursuant to Rule 33(d). Mueller also reserves the right to supplement and/or change its response to this Interrogatory as discovery and the case progress.

**INTERROGATORY NO. 18:**

Describe all costs incurred for the accused products that are accounted for when pricing the accused products and forecasting profits, revenues, and sales of the accused products.

**RESPONSE:**

Mueller objects to this Interrogatory to the extent it seeks information that is protected by the attorney-client privilege and/or by the work product immunity. Mueller further objects to this Interrogatory as overly broad and unduly burdensome as it seeks information not relevant to the subject matter involved in this litigation nor proportional to the needs of the case.

Subject to and without waiving its objections, Mueller responds as follows:

Mueller has not yet completed its investigation and review of documents regarding this Interrogatory. Based on its objections and understanding of the Interrogatory, Mueller will identify relevant documents for the accused products, if such documents exist, and reserves the right to produce documents pursuant to Rule 33(d). Mueller also reserves the right to supplement and/or change its response to this Interrogatory as discovery and the case progress.

**INTERROGATORY NO. 19:**

Describe your historical market share, sales volume, pricing, revenues, costs, profits, profit margins, and cash flows relating to the accused products in the U.S. since October 27, 2021, including any studies and analyses used to determine your historical market share, sales volume,

pricing, revenues, costs, profits, profit margins, and cash flows relating to the accused products in the U.S. since October 27, 2021.

**RESPONSE:**

Mueller objects to this Interrogatory to the extent it seeks information that is protected by the attorney-client privilege and/or by the work product immunity. Mueller further objects to this Interrogatory as overly broad and unduly burdensome as it seeks information not relevant to the subject matter involved in this litigation nor proportional to the needs of the case.

Subject to and without waiving its objections, Mueller responds as follows:

Mueller has not yet completed its investigation and review of documents regarding this Interrogatory. Based on its objections and understanding of the Interrogatory, Mueller will identify relevant documents for the accused products, if such documents exist, and reserves the right to produce documents pursuant to Rule 33(d). Mueller also reserves the right to supplement and/or change its response to this Interrogatory as discovery and the case progress.

**INTERROGATORY NO. 20:**

Describe the market demand and the factors that affect market demand for the accused products and the products and services that are marketed, offered, and sold with the accused products, including all reports and studies used to determine market demand and the factors that affect market demand for the accused products.

**RESPONSE:**

Mueller objects to this Interrogatory to the extent it seeks information that is protected by the attorney-client privilege and/or by the work product immunity. Mueller further objects to this

Interrogatory as overly broad and unduly burdensome as it seeks information not relevant to the subject matter involved in this litigation nor proportional to the needs of the case.

Subject to and without waiving its objections, Mueller responds as follows:

Mueller has not yet completed its investigation and review of documents regarding this Interrogatory. Based on its objections and understanding of the Interrogatory, Mueller will identify relevant documents for the accused products, if such documents exist, and reserves the right to produce documents pursuant to Rule 33(d). Mueller also reserves the right to supplement and/or change its response to this Interrogatory as discovery and the case progress.

**INTERROGATORY NO. 21:**

Describe your available or potentially available non-infringing alternative technologies, including the costs and development time for the available or potentially available non-infringing alternative technologies.

**RESPONSE:**

Mueller objects to this Interrogatory to the extent it seeks information that is protected by the attorney-client privilege and/or by the work product immunity. Mueller further objects to this Interrogatory as premature because the Court has not yet construed the disputed terms of the Asserted Claims. Mueller objects to this Interrogatory as vague and ambiguous as it is not understood at this time what is meant by "your available or potentially available non-infringing alternative technologies." Without the Court's claim construction order, Mueller would be required to speculate as to what constitutes "your available or potentially available non-infringing alternative technologies." Mueller further objects to this interrogatory to the extent it calls for

responses that are the subject of expert testimony when the parties have not yet engaged in expert discovery or exchanged expert reports.

Subject to and without waiving its objections, Mueller responds as follows:

Mueller identifies its own and competitor AMR systems as available or potentially available non-infringing alternative technologies.

Mueller reserves the right to supplement and/or change its response to this Interrogatory as discovery and the case progress and as required by the Court's Orders and the Federal and Local Rules.

**INTERROGATORY NO. 22:**

Describe the acceptability by the public for your available or potentially available non-infringing alternative technologies, including any evaluation, studies, testing, and analysis relied upon for determining the acceptability by the public for your available or potentially available non-infringing alternative technologies.

**RESPONSE:**

Mueller objects to this Interrogatory to the extent it seeks information that is protected by the attorney-client privilege and/or by the work product immunity. Mueller further objects to this Interrogatory as premature because the Court has not yet construed the disputed terms of the Asserted Claims. Mueller objects to this Interrogatory as vague and ambiguous as it is not understood at this time what is meant by "your available or potentially available non-infringing alternative technologies." Without the Court's claim construction order, Mueller would be required to speculate as to what constitutes "your available or potentially available non-infringing alternative technologies." Mueller further objects to this interrogatory to the extent it calls for

responses that are the subject of expert testimony when the parties have not yet engaged in expert discovery or exchanged expert reports.

Subject to and without waiving its objections, Mueller responds as follows:

Mueller states that its own and competitor AMR systems have been available and successfully serving customers throughout the United States (*see e.g.*, https://en.wikipedia.org/wiki/Mueller_Systems#Installation_Case_Studies_/_News).

Mueller reserves the right to supplement and/or change its response to this Interrogatory as discovery and the case progress and as required by the Court's Orders and the Federal and Local Rules.

**INTERROGATORY NO. 23:**

Describe your policies and marketing programs for licensing patented technologies.

**RESPONSE:**

Mueller objects to this Interrogatory to the extent it seeks information that is protected by the attorney-client privilege and/or by the work product immunity. Mueller further objects to this Interrogatory as overly broad and unduly burdensome as it seeks information not relevant to the subject matter involved in this litigation nor proportional to the needs of the case.

Subject to and without waiving its objections, Mueller responds as follows:

[redacted]

[redacted] Further, Mueller has not yet completed its investigation and review of documents regarding this Interrogatory. Based on its objections and understanding of the Interrogatory,

Mueller will identify relevant documents for the accused products, if such documents exist, and reserves the right to produce documents pursuant to Rule 33(d). Mueller also reserves the right to supplement and/or change its response to this Interrogatory as discovery and the case progress.

**INTERROGATORY NO. 24:**

Describe any negotiations and discussions between you and any non-affiliated business entity or individual concerning the licensing or possible licensing of patented technologies similar to the Patents-in-Suit, including any license, purchase, or settlement agreements executed or amended between you (as either licensor or licensee) and any other non-affiliated business entity or individual involving technologies similar to the Patents-in-Suit.

**RESPONSE:**

Mueller objects to this Interrogatory to the extent it seeks information that is protected by the attorney-client privilege and/or by the work product immunity. Mueller further objects to this Interrogatory as vague and ambiguous as it is not understood at this time what is meant by "patented technologies similar to the Patents-in-Suit." Mueller further objects to this interrogatory to the extent it calls for responses that are the subject of expert testimony when the parties have not yet engaged in expert discovery or exchanged expert reports.

Subject to and without waiving its objections, Mueller responds as follows:

Mueller is unaware of "any negotiations and discussions" regarding "patented technologies similar to the Patents-in-Suit." Mueller's response to this Interrogatory is made based on present knowledge, and its investigation and review of documents is ongoing. Mueller reserves the right to supplement and/or change its response as discovery and the case progress.

**INTERROGATORY NO. 25:**

Describe all known comparable license agreements to the claims of the Patents-in-Suit and explain or demonstrate how they are comparable to the claims of the Patents-in-Suit.

**RESPONSE:**

Mueller objects to this Interrogatory to the extent it seeks information that is protected by the attorney-client privilege and/or by the work product immunity. Mueller further objects to this Interrogatory as vague and ambiguous as it is not understood at this time what is meant by "comparable license agreements to the claims of the Patents-in-Suit" and "comparable to technologies claimed in patents-in-suit."

Mueller further objects to this Interrogatory as premature because the Court has not yet construed the disputed terms of the Asserted Claims. Without the Court's claim construction order, Mueller would be required to speculate as to what constitutes "comparable license agreements to the claims of the Patents-in-Suit" and comparable to technologies claimed in patents-in-suit." Mueller further objects to this interrogatory to the extent it calls for responses that are the subject of expert testimony when the parties have not yet engaged in expert discovery or exchanged expert reports.

Mueller reserves the right to supplement and/or change its response to this Interrogatory as discovery and the case progress and as required by the Court's Orders and the Federal and Local Rules.

Respectfully submitted this 3rd day of July, 2023.

Respectfully submitted,

By: /s/ *Seth K. Trimble*
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*Attorneys for Defendant*
*Mueller Systems, LLC*

**RESTRICTED - ATTORNEYS' EYES ONLY**

**CERTIFICATE OF SERVICE**

I hereby certify that on this day, I served a true and correct copy of the foregoing **DEFENDANT'S RESPONSES TO PLAINTIFF'S INTERROGATORIES (1-25)** on all counsel of record by electronic mail delivery as follows:

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This 3rd day of July, 2023.

*/s/ Seth K. Trimble*
Seth K. Trimble

*Attorney for Defendant*
*Mueller Systems, LLC*

# EXHIBIT O

EXHIBIT 2

Mueller's Response to Rein Tech's Request for Interrogatories

RESTRICTED - ATTORNEYS' EYES ONLY

IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE

| | |
|---|---|
| REIN TECH, INC.,<br>Plaintiff,<br>v.<br>MUELLER SYSTEMS, LLC,<br>Defendant. | No. 1:18-cv-01683-MN |

# DEFENDANT'S RESPONSES TO PLAINTIFF'S INTERROGATORIES (1-25)

Pursuant to Rules 26 and 33 of the Federal Rules of Civil Procedure, Mueller Systems, LLC ("Mueller" or "Defendant") hereby serves its responses to Plaintiff Rein Tech, Inc.'s ("Rein Tech" or "Plaintiff") Interrogatories (1-25) ("Interrogatories").

## PRELIMINARY STATEMENT

1. Mueller has responded to the Interrogatories as it interprets and understands them. If Rein Tech subsequently asserts an interpretation of any interrogatory that differs from Mueller's understanding, Mueller reserves the right to supplement or amend its objections and/or responses.

2. The responses set forth herein are based on information presently available to Mueller following a diligent search, reasonable in scope, for information in its possession, custody or control. Mueller reserves the right to complete its investigation and discovery of the facts, and to rely at trial or in other proceedings on documents and information in addition to the information provided herein, regardless of whether such information is newly discovered or newly in existence.

3. In that regard, Mueller reserves the right to revise, amend, correct, supplement, modify or clarify its objections and responses in accordance with the Federal Rules of Civil

Procedure.

4. Mueller will not produce information protected from disclosure by the attorney-client privilege, the work product immunity and/or any other applicable privilege or immunity. Inadvertent disclosure of information that is privileged, prepared in anticipation of litigation or for trial, or otherwise immune from discovery, shall not constitute a waiver of any privilege or of any ground for objection to discovery with respect to such information, or the subject matter thereof or the information contained therein, or of the right of Mueller to object to the use of any such information during any subsequent proceeding.

5. Mueller has various documents and information in its possession, custody, or control that are subject to third-party confidentiality restrictions. If any information is withheld from disclosure on the basis of third-party confidentiality restrictions, Mueller will identify the third party, begin discussions with the third-party regarding disclosure of the information, and advise Rein Tech of its efforts relating to same.

6. Subject to the Federal Rules of Civil Procedure, Mueller's responses to the Interrogatories shall not constitute an admission by Mueller either that any Interrogatory or any response thereto is relevant to, or admissible as evidence in, any trial or other proceeding. All objections as to privilege, immunity, relevance, authenticity or admissibility of any information or documents referred to herein are expressly reserved. Unless otherwise indicated in a specific response, Mueller's responses to the Interrogatories are not a concession that any individual identified by Mueller will be called as a witness or that such person possesses discoverable information, or that the subject matter of the particular interrogatory is relevant to this action.

## SPECIFIC OBJECTIONS AND RESPONSES TO INTERROGATORIES (1-25)

**INTERROGATORY NO. 1:**

Describe the process of submitting a plan, obtaining approval, installing the accused products, money revenue received, and costs agreed upon for contracted projects with third parties using the accused products since 2018.

**RESPONSE:**

Mueller objects to this Interrogatory to the extent it seeks information that is protected by the attorney-client privilege and/or by the work product immunity. Mueller further objects to this Interrogatory as overly broad and unduly burdensome as it seeks information not relevant to the subject matter involved in this litigation nor proportional to the needs of the case. Based on its objections and understanding of the Interrogatory, Mueller states that for LoRaWAN projects, prior to an award, Mueller receives a request for a quote for the cost of products and services to be provided. The request may include installation locations and quantities of Mueller LoRaWAN Nodes. Upon receiving the request, Mueller determines the number of units and personnel [redacted] subsequently submitted to the potential customer. Upon notification of approval by the customer [redacted] placed with Mueller's manufacturing department for the build of required nodes and services. During the material build process, firmware and security keys are installed within the nodes. The systems are then installed pursuant to specifications set forth in a contract. Payment is likewise

made pursuant to the specifications in the contract.

For cellular systems, the process is similar. However, before Mueller provides a quote, the [redacted] regarding this Interrogatory. Based on its objections and understanding of the Interrogatory, Mueller will identify relevant plans and related documents, if such documents exists, and reserves the right to produce documents pursuant to Rule 33(d). Mueller also reserves the right to supplement and/or change its response to this interrogatory as discovery and the case progress.

**INTERROGATORY NO. 2:**

Describe the number of LoRa and Cellular installations for contracted projects with third parties using the accused products since 2018.

**RESPONSE:**

Mueller objects to this Interrogatory to the extent it seeks information that is protected by the attorney-client privilege and/or by the work product immunity. Based on its objections and understanding of the Interrogatory, Mueller states that since 2018, it has approximately two pilot cellular installations and two LoRaWAN installations.

Mueller's response to this Interrogatory is made based on present knowledge, and its investigation and review of documents is ongoing. Mueller reserves the right to supplement and/or change its response as discovery and the case progress.

**INTERROGATORY NO. 3:**

Describe the LoRa and Cellular infrastructure and maintenance costs for contracted projects with third parties using the accused products since 2018.

**RESPONSE:**

Mueller objects to this Interrogatory to the extent it seeks information that is protected by the attorney-client privilege and/or by the work product immunity. Mueller further objects to this Interrogatory as overly broad and unduly burdensome as it seeks information not relevant to the subject matter involved in this litigation nor proportional to the needs of the case. Mueller further objects to this Interrogatory as ambiguous, as "costs" is not defined. Based on its objections and

[redacted]

regarding this Interrogatory. Based on its objections and understanding of the Interrogatory, Mueller will identify relevant documents, if such documents exists, and reserves the right to produce documents pursuant to Rule 33(d). Mueller also reserves the right to supplement and/or change its response to this interrogatory as discovery and the case progress.

**INTERROGATORY NO. 4:**

Describe the MiNet and MiHub systems and their association with the accused products since 2018.

**RESPONSE:**

Mueller objects to this Interrogatory to the extent it seeks information that is protected by the attorney-client privilege and/or by the work product immunity. Mueller further objects to this Interrogatory as vague and unclear as it is not understood what is meant by "association with."

Subject to and without waiving its objections, Mueller responds as follows:

Mi.Hub has no association to the accused products. The Mi.Net Network has no

association to the accused products.

To the extent "MiNet system[]" refers to Mueller's backend software system and related infrastructure, the backend software comprises a server hosted by Amazon Web Services ("AWS") executing Mueller's proprietary Sentryx™ software for monitoring and control of nodes at remote locations. These nodes may include LoRaWAN or Cellular nodes, at least some of which may be connected to 420 Remote Disconnect Meters ("RDMs") at customer premises (420 RDM with a LoRaWAN or Cellular node referred to as a "420 RDM Node"). The Sentryx™ software is accessible by Mueller and certain customers (such as water utilities), who are assigned access credentials for monitoring end-user customer water data and, in at least some cases, controlling 420 RDM Nodes.

Information is securely transferred from 420 RDM Nodes to the Sentryx™ server and is made available to customers (such as water utilities) through a web interface, which may integrate with a customer's billing software. The Sentryx™ software provides powerful analytics, combining meter read data with information from Mueller's optional integrated acoustic leak detection and pressure monitoring solutions as well as third party data sources, such as sensors and control devices.

Mueller's response to this Interrogatory is made based on present knowledge, and its

investigation and review of documents is ongoing. Mueller reserves the right to supplement and/or change its response as discovery and the case progress.

**INTERROGATORY NO. 5:**

Describe when and how a residential user, corporate user, or water municipality is provided an alert of a water leak and what options are available for each of the residential user, corporate user, and water municipality upon alert of a leak.

**RESPONSE:**

Mueller objects to this Interrogatory to the extent it seeks information that is protected by the attorney-client privilege and/or by the work product immunity. Mueller further objects to this Interrogatory as vague and unclear as it is not understood what is meant by "options."

Subject to and without waiving its objections, Mueller responds as follows:

Water data is communicated by a 420 RDM Node to Mueller's backend Sentryx™ server. The Sentryx™ software detects leaks by analyzing the water data and generating associated alerts. The 420 RDM Node may generate an overflow alert in the event of a particularly high consumption of water within a certain interval of time. The overflow alert is communicated to the backend Sentryx™ server. Mueller personnel accessing the Sentryx™ server, as well as certain customers with credentials for accessing the Sentryx™ server, may send disconnect commands to the 420 RDM Node to cease the flow of water therethrough, for example, upon receipt of a leak or overflow alert.

Mueller's response to this Interrogatory is made based on present knowledge, and its investigation and review of documents is ongoing. Mueller reserves the right to supplement and/or change its response as discovery and the case progress.

**INTERROGATORY NO. 6:**

Describe all data related to the accused products that is stored, transmitted, or harbored by Amazon Web Services or other cloud computing companies.

**RESPONSE:**

Mueller objects to this Interrogatory to the extent it seeks information that is protected by the attorney-client privilege and/or by the work product immunity. Mueller further objects to this Interrogatory as overly broad and unduly burdensome be requesting a description of "all data" stored and related to the accused products. Mueller further objects to this Interrogatory as vague and ambiguous as it is not understood how "stored" data differs from "harbored" data.

Subject to and without waiving its objections, Mueller responds as follows:

Mueller's response to this Interrogatory is made based on present knowledge, and its investigation and review of documents is ongoing. Mueller reserves the right to supplement and/or change its response as discovery and the case progress.

**INTERROGATORY NO. 7:**

Describe where and how the water use data for all currently contracted water meter projects using the accused products are stored and how the data is used by a Network Operations Center or home residents.

**RESPONSE:**

Mueller objects to this Interrogatory to the extent it seeks information that is protected by the attorney-client privilege and/or by the work product immunity. Mueller further objects to this Interrogatory as vague and ambiguous as it is not understood what is meant by "how the data is used by a Network Operations Center or home residents."

Subject to and without waiving its objections, Mueller responds as follows:

Data for contracted projects using the accused products is stored on storage devices [redacted] storage devices associated with the Sentryx™ server is used by Mueller personnel and customers with credentials for accessing the Sentryx™ server (such as various water utilities) to monitor water usage of various end-user customers in a locality and to control RDM Nodes by disconnecting water flow, for example, in the event of detection of certain alarm conditions.

Mueller's response to this Interrogatory is made based on present knowledge, and its investigation and review of documents is ongoing. Mueller reserves the right to supplement and/or change its response as discovery and the case progress.

**INTERROGATORY NO. 8:**

Describe the Sentryx system and algorithm, what they are, and how they are used with the accused products.

**RESPONSE:**

Mueller objects to this Interrogatory to the extent it seeks information that is protected by the attorney-client privilege and/or by the work product immunity. Mueller further objects to this Interrogatory as vague and ambiguous as it is not understood what is meant by "Describe the . . . algorithm."

Subject to and without waiving its objections, Mueller responds as follows:

Mueller's backend software comprises a server hosted by AWS executing Mueller's proprietary Sentryx™ software for monitoring and control of nodes at remote locations. These nodes may include 420 RDM Nodes at customers' premises. The Sentryx™ software is accessible by Mueller and certain customers (such as water utilities), who are assigned access credentials for monitoring end-user customer water data and, in at least some cases, controlling 420 RDM Nodes.

Information is securely transferred from 420 RDM Nodes to the Sentryx™ server and is made available to customers (such as water utilities) through a web interface, which may integrate with a customer's billing software. The Sentryx™ software provides powerful analytics, combining meter read data with information from Mueller's optional integrated acoustic leak detection and pressure monitoring solutions as well as third party data sources, such as sensors and control devices.

[redacted]

[redacted]

Water data is communicated by a 420 RDM Node to Mueller's backend Sentryx™ server. The Sentryx™ software detects leaks by analyzing the water data and generating associated alerts. The 420 RDM Node may generate an overflow alert in the event of a particularly high consumption of water within a certain interval of time. The overflow alert is communicated to the backend Sentryx™ server. Mueller personnel accessing the Sentryx™ server, as well as certain customers with credentials for accessing the Sentryx™ server, may send disconnect commands to the 420 RDM Node to cease the flow of water therethrough, for example, upon receipt of a leak or overflow alert.

[redacted]

Data for contracted projects using the accused products is stored on storage devices

[redacted]

server is used by Mueller personnel and customers with credentials for accessing the Sentryx™ server (such as various water utilities) to monitor water usage of various end-user customers in a locality and to control RDM Nodes by disconnecting water flow, for example, in the event of detection of certain alarm conditions.

Mueller's response to this Interrogatory is made based on present knowledge, and its investigation and review of documents is ongoing. Mueller reserves the right to supplement and/or change its response as discovery and the case progress.

**INTERROGATORY NO. 9:**

Describe the number and percentage of solid-state water meters (SSMs) that are currently installed the field under contract with third parties that use wireless technology.

**RESPONSE:**

Mueller objects to this Interrogatory to the extent it seeks information that is protected by the attorney-client privilege and/or by the work product immunity. Mueller further objects to this Interrogatory as overly broad and unduly burdensome as it seeks information not relevant to the subject matter involved in this litigation nor proportional to the needs of the case. Mueller further objects to this Interrogatory as vague and ambiguous as it is not understood what is meant by "percentage of solid-state water meters (SSMs)" and, more specifically, to what measure the "percentage of solid-state water meters (SSMs)" is relative.

Subject to and without waiving its objections, Mueller responds as follows:

Mueller has not yet completed its investigation and review of documents regarding this Interrogatory. Based on its objections and understanding of the Interrogatory, Mueller will identify

relevant documents for the accused products, if such documents exist, and reserves the right to produce documents pursuant to Rule 33(d).

**INTERROGATORY NO. 10:**

Describe the number and percentage of SSM water meters using a control valve currently installed in the field under contract with third parties.

**RESPONSE:**

Mueller objects to this Interrogatory to the extent it seeks information that is protected by the attorney-client privilege and/or by the work product immunity. Mueller further objects to this Interrogatory as vague and ambiguous as it is not understood what is meant by "percentage of SSM water meters" and, more specifically, to what measure the "percentage of SSM water meters" is relative.

Subject to and without waiving its objections, Mueller responds as follows:

No SSM water meters currently installed in the field under contract with third parties use a control valve.

Mueller's response to this Interrogatory is made based on present knowledge, and its investigation and review of documents is ongoing. Mueller reserves the right to supplement and/or change its response as discovery and the case progress.

**INTERROGATORY NO. 11:**

Describe the options for wired or wireless communications, wireless LoRa, and Cellular networks using Mi.Net® Fixed Network Collectors with the accused products and any corporate network infrastructure using Mi.Net® Fixed Network Collectors with the accused products.

**RESPONSE:**

Mueller objects to this Interrogatory to the extent it seeks information that is protected by the attorney-client privilege and/or by the work product immunity. Mueller further objects to this Interrogatory as vague and ambiguous as it is not understood what is meant by "options for wired or wireless communications, wireless LoRa, and Cellular networks."

Mueller further objects to this Interrogatory as vague and ambiguous as it is not understood what is meant by "corporate network infrastructure." For example, does this refer to Mueller's network infrastructure? A third-party's network infrastructure? A customer's network infrastructure?

Subject to and without waiving its objections, Mueller responds as follows:

There are no options for wired or wireless communications, wireless LoRa, and Cellular networks using Mi.Net® Fixed Network Collectors with the accused products and any corporate network infrastructure using Mi.Net® Fixed Network Collectors with the accused products.

Mueller's response to this Interrogatory is made based on present knowledge, and its investigation and review of documents is ongoing. Mueller reserves the right to supplement and/or change its response as discovery and the case progress.

**INTERROGATORY NO. 12:**

Describe your marketing of the accused products including the use of sales literature, such as brochures, flyers, bulletins, advertisements, pamphlets, catalog entries, product announcements, product descriptions, and other similar documents.

**RESPONSE:**

Mueller objects to this Interrogatory to the extent it seeks information that is protected by the attorney-client privilege and/or by the work product immunity. Mueller further objects to this

Interrogatory as overly broad and unduly burdensome as it seeks information not relevant to the subject matter involved in this litigation nor proportional to the needs of the case as this Interrogatory would require Mueller to describe all marketing activities of Mueller's marketing department, which uses traditional marketing methods to market Mueller's products, including the accused devices. Subject to and without waiving its objections, Mueller responds as follows: Mueller's marketing methods include, but are not limited to, use of websites (e.g., https://muellersystems.com/ami-solutions/lorawan/ and https://muellersystems.com/ami-solutions/cellular-node/), brochures, datasheets, articles, press releases, and flyers. Further, Mueller has not yet completed its investigation and review of documents regarding this Interrogatory. Based on its objections and understanding of the Interrogatory, Mueller will identify relevant marketing documents, and reserves the right to produce documents pursuant to Rule 33(d). Mueller also reserves the right to supplement and/or change its response to this Interrogatory as discovery and the case progress.

**INTERROGATORY NO. 13:**

Describe your examinations, evaluations, analyses, or studies of the technology and features of the accused products in comparison to the technology and features offered by your competitors.

**RESPONSE:**

Mueller objects to this Interrogatory to the extent it seeks information that is protected by the attorney-client privilege and/or by the work product immunity. Mueller further objects to this Interrogatory as vague and ambiguous as it is not understood what is meant by "the technology

and features of the accused products in comparison to the technology and features offered by your competitors."

Subject to and without waiving its objections, Mueller responds as follows:

Mueller receives relevant industry publications and reports (e.g., an insight report from Bluefield Research) containing evaluations and analyses of technology and features offered by Mueller's competitors. Further, Mueller has not yet completed its investigation and review of documents regarding this Interrogatory. Based on its objections and understanding of the Interrogatory, Mueller will identify any relevant examinations, evaluations, analyses, or studies, if such documents exist, and reserves the right to produce documents pursuant to Rule 33(d). Mueller also reserves the right to supplement and/or change its response to this Interrogatory as discovery and the case progress.

**INTERROGATORY NO. 14:**

Describe your market assessments of the accused products, including market summaries, reviews, analyses, evaluations, studies, and comments including but not limited to market projections and market projection models, projected market penetration and market share studies, market surveys, focus group studies, customer satisfaction surveys, and competitive position analyses.

**RESPONSE:**

Mueller objects to this Interrogatory to the extent it seeks information that is protected by the attorney-client privilege and/or by the work product immunity. Mueller further objects to this Interrogatory as vague and ambiguous as it is not understood what is meant by "the technology

and features of the accused products in comparison to the technology and features offered by your competitors."

Subject to and without waiving its objections, Mueller responds as follows:

Mueller receives relevant industry publications and reports (e.g., an insight report from Bluefield Research) containing evaluations and analyses of technology and features offered by Mueller's competitors. Further, Mueller has not yet completed its investigation and review of documents regarding this Interrogatory. Based on its objections and understanding of the Interrogatory, Mueller will identify any relevant examinations, evaluations, analyses, or studies, if such documents exist, and reserves the right to produce documents pursuant to Rule 33(d). Mueller also reserves the right to supplement and/or change its response to this Interrogatory as discovery and the case progress.

**INTERROGATORY NO. 15:**

Describe your strategic plans and business plans for the accused products for competing against your competitors, including any identification, review, analysis, evaluation, assessment, study, and summary regarding your competitors' technologies that compete with the accused products.

**RESPONSE:**

Mueller objects to this Interrogatory to the extent it seeks information that is protected by the attorney-client privilege and/or by the work product immunity. Mueller further objects to this Interrogatory as vague and ambiguous as it is not understood what is meant by "the technology and features of the accused products in comparison to the technology and features offered by your competitors."

Subject to and without waiving its objections, Mueller responds as follows:

Mueller receives relevant industry publications and reports (e.g., an insight report from Bluefield Research) containing evaluations and analyses of technology and features offered by Mueller's competitors. Mueller generally considers such research when developing its strategic and business plans. Further, Mueller has not yet completed its investigation and review of documents regarding this Interrogatory. Based on its objections and understanding of the Interrogatory, Mueller will identify any relevant examinations, evaluations, analyses, or studies, if such documents exist, and reserves the right to produce documents pursuant to Rule 33(d). Mueller also reserves the right to supplement and/or change its response to this Interrogatory as discovery and the case progress.

**INTERROGATORY NO. 16:**

Describe your actual, forecasted, planned, and budgeted gross and net sales, gross and net profits, gross and net profit margins, and gross and net revenues for the accused products and all products and services that have been marketed, offered, and sold in connection with the accused products in and from the U.S. since October 27, 2021.

**RESPONSE:**

Mueller objects to this Interrogatory to the extent it seeks information that is protected by the attorney-client privilege and/or by the work product immunity. Mueller further objects to this Interrogatory as overly broad and unduly burdensome as it seeks information not relevant to the subject matter involved in this litigation nor proportional to the needs of the case as it would require Mueller to summarize numerous financial records and reports. Mueller further objects to this Interrogatory as vague and ambiguous as it is not understood what is meant by "the technology

and features of the accused products in comparison to the technology and features offered by your competitors."

Subject to and without waiving its objections, Mueller responds as follows:

Mueller has not yet completed its investigation and review of documents regarding this Interrogatory. Based on its objections and understanding of the Interrogatory, Mueller will identify relevant financial records and reports for the accused products, if such documents exist, and reserves the right to produce documents pursuant to Rule 33(d). Mueller also reserves the right to supplement and/or change its response to this Interrogatory as discovery and the case progress.

**INTERROGATORY NO. 17:**

Describe how you price the accused products and the individual products, technologies, and services that you offer in connection with the accused products, including any strategic analyses prepared in connection with setting the prices of the accused products and the perceived value of the individual products, technologies, and services offered in connection with the accused products.

**RESPONSE:**

Mueller objects to this Interrogatory to the extent it seeks information that is protected by the attorney-client privilege and/or by the work product immunity. Mueller further objects to this Interrogatory as overly broad and unduly burdensome as it seeks information not relevant to the subject matter involved in this litigation nor proportional to the needs of the case.

Subject to and without waiving its objections, Mueller responds as follows:

Mueller has not yet completed its investigation and review of documents regarding this Interrogatory. Based on its objections and understanding of the Interrogatory, Mueller will identify

relevant documents for the accused products, if such documents exist, and reserves the right to produce documents pursuant to Rule 33(d). Mueller also reserves the right to supplement and/or change its response to this Interrogatory as discovery and the case progress.

**INTERROGATORY NO. 18:**

Describe all costs incurred for the accused products that are accounted for when pricing the accused products and forecasting profits, revenues, and sales of the accused products.

**RESPONSE:**

Mueller objects to this Interrogatory to the extent it seeks information that is protected by the attorney-client privilege and/or by the work product immunity. Mueller further objects to this Interrogatory as overly broad and unduly burdensome as it seeks information not relevant to the subject matter involved in this litigation nor proportional to the needs of the case.

Subject to and without waiving its objections, Mueller responds as follows:

Mueller has not yet completed its investigation and review of documents regarding this Interrogatory. Based on its objections and understanding of the Interrogatory, Mueller will identify relevant documents for the accused products, if such documents exist, and reserves the right to produce documents pursuant to Rule 33(d). Mueller also reserves the right to supplement and/or change its response to this Interrogatory as discovery and the case progress.

**INTERROGATORY NO. 19:**

Describe your historical market share, sales volume, pricing, revenues, costs, profits, profit margins, and cash flows relating to the accused products in the U.S. since October 27, 2021, including any studies and analyses used to determine your historical market share, sales volume,

pricing, revenues, costs, profits, profit margins, and cash flows relating to the accused products in the U.S. since October 27, 2021.

**RESPONSE:**

Mueller objects to this Interrogatory to the extent it seeks information that is protected by the attorney-client privilege and/or by the work product immunity. Mueller further objects to this Interrogatory as overly broad and unduly burdensome as it seeks information not relevant to the subject matter involved in this litigation nor proportional to the needs of the case.

Subject to and without waiving its objections, Mueller responds as follows:

Mueller has not yet completed its investigation and review of documents regarding this Interrogatory. Based on its objections and understanding of the Interrogatory, Mueller will identify relevant documents for the accused products, if such documents exist, and reserves the right to produce documents pursuant to Rule 33(d). Mueller also reserves the right to supplement and/or change its response to this Interrogatory as discovery and the case progress.

**INTERROGATORY NO. 20:**

Describe the market demand and the factors that affect market demand for the accused products and the products and services that are marketed, offered, and sold with the accused products, including all reports and studies used to determine market demand and the factors that affect market demand for the accused products.

**RESPONSE:**

Mueller objects to this Interrogatory to the extent it seeks information that is protected by the attorney-client privilege and/or by the work product immunity. Mueller further objects to this

Interrogatory as overly broad and unduly burdensome as it seeks information not relevant to the subject matter involved in this litigation nor proportional to the needs of the case.

Subject to and without waiving its objections, Mueller responds as follows:

Mueller has not yet completed its investigation and review of documents regarding this Interrogatory. Based on its objections and understanding of the Interrogatory, Mueller will identify relevant documents for the accused products, if such documents exist, and reserves the right to produce documents pursuant to Rule 33(d). Mueller also reserves the right to supplement and/or change its response to this Interrogatory as discovery and the case progress.

**INTERROGATORY NO. 21:**

Describe your available or potentially available non-infringing alternative technologies, including the costs and development time for the available or potentially available non-infringing alternative technologies.

**RESPONSE:**

Mueller objects to this Interrogatory to the extent it seeks information that is protected by the attorney-client privilege and/or by the work product immunity. Mueller further objects to this Interrogatory as premature because the Court has not yet construed the disputed terms of the Asserted Claims. Mueller objects to this Interrogatory as vague and ambiguous as it is not understood at this time what is meant by "your available or potentially available non-infringing alternative technologies." Without the Court's claim construction order, Mueller would be required to speculate as to what constitutes "your available or potentially available non-infringing alternative technologies." Mueller further objects to this interrogatory to the extent it calls for

responses that are the subject of expert testimony when the parties have not yet engaged in expert discovery or exchanged expert reports.

Subject to and without waiving its objections, Mueller responds as follows:

Mueller identifies its own and competitor AMR systems as available or potentially available non-infringing alternative technologies.

Mueller reserves the right to supplement and/or change its response to this Interrogatory as discovery and the case progress and as required by the Court's Orders and the Federal and Local Rules.

**INTERROGATORY NO. 22:**

Describe the acceptability by the public for your available or potentially available non-infringing alternative technologies, including any evaluation, studies, testing, and analysis relied upon for determining the acceptability by the public for your available or potentially available non-infringing alternative technologies.

**RESPONSE:**

Mueller objects to this Interrogatory to the extent it seeks information that is protected by the attorney-client privilege and/or by the work product immunity. Mueller further objects to this Interrogatory as premature because the Court has not yet construed the disputed terms of the Asserted Claims. Mueller objects to this Interrogatory as vague and ambiguous as it is not understood at this time what is meant by "your available or potentially available non-infringing alternative technologies." Without the Court's claim construction order, Mueller would be required to speculate as to what constitutes "your available or potentially available non-infringing alternative technologies." Mueller further objects to this interrogatory to the extent it calls for

responses that are the subject of expert testimony when the parties have not yet engaged in expert discovery or exchanged expert reports.

Subject to and without waiving its objections, Mueller responds as follows:

Mueller states that its own and competitor AMR systems have been available and successfully serving customers throughout the United States (*see e.g.*, https://en.wikipedia.org/wiki/Mueller_Systems#Installation_Case_Studies_/_News).

Mueller reserves the right to supplement and/or change its response to this Interrogatory as discovery and the case progress and as required by the Court's Orders and the Federal and Local Rules.

**INTERROGATORY NO. 23:**

Describe your policies and marketing programs for licensing patented technologies.

**RESPONSE:**

Mueller objects to this Interrogatory to the extent it seeks information that is protected by the attorney-client privilege and/or by the work product immunity. Mueller further objects to this Interrogatory as overly broad and unduly burdensome as it seeks information not relevant to the subject matter involved in this litigation nor proportional to the needs of the case.

Subject to and without waiving its objections, Mueller responds as follows:

regarding this Interrogatory. Based on its objections and understanding of the Interrogatory,

Mueller will identify relevant documents for the accused products, if such documents exist, and reserves the right to produce documents pursuant to Rule 33(d). Mueller also reserves the right to supplement and/or change its response to this Interrogatory as discovery and the case progress.

**INTERROGATORY NO. 24:**

Describe any negotiations and discussions between you and any non-affiliated business entity or individual concerning the licensing or possible licensing of patented technologies similar to the Patents-in-Suit, including any license, purchase, or settlement agreements executed or amended between you (as either licensor or licensee) and any other non-affiliated business entity or individual involving technologies similar to the Patents-in-Suit.

**RESPONSE:**

Mueller objects to this Interrogatory to the extent it seeks information that is protected by the attorney-client privilege and/or by the work product immunity. Mueller further objects to this Interrogatory as vague and ambiguous as it is not understood at this time what is meant by "patented technologies similar to the Patents-in-Suit." Mueller further objects to this interrogatory to the extent it calls for responses that are the subject of expert testimony when the parties have not yet engaged in expert discovery or exchanged expert reports.

Subject to and without waiving its objections, Mueller responds as follows:

Mueller is unaware of "any negotiations and discussions" regarding "patented technologies similar to the Patents-in-Suit." Mueller's response to this Interrogatory is made based on present knowledge, and its investigation and review of documents is ongoing. Mueller reserves the right to supplement and/or change its response as discovery and the case progress.

**INTERROGATORY NO. 25:**

Describe all known comparable license agreements to the claims of the Patents-in-Suit and explain or demonstrate how they are comparable to the claims of the Patents-in-Suit.

**RESPONSE:**

Mueller objects to this Interrogatory to the extent it seeks information that is protected by the attorney-client privilege and/or by the work product immunity. Mueller further objects to this Interrogatory as vague and ambiguous as it is not understood at this time what is meant by "comparable license agreements to the claims of the Patents-in-Suit" and "comparable to technologies claimed in patents-in-suit."

Mueller further objects to this Interrogatory as premature because the Court has not yet construed the disputed terms of the Asserted Claims. Without the Court's claim construction order, Mueller would be required to speculate as to what constitutes "comparable license agreements to the claims of the Patents-in-Suit" and comparable to technologies claimed in patents-in-suit." Mueller further objects to this interrogatory to the extent it calls for responses that are the subject of expert testimony when the parties have not yet engaged in expert discovery or exchanged expert reports.

Mueller reserves the right to supplement and/or change its response to this Interrogatory as discovery and the case progress and as required by the Court's Orders and the Federal and Local Rules.

Respectfully submitted this 3rd day of July, 2023.

Respectfully submitted,

By: /s/ *Seth K. Trimble*
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*Attorneys for Defendant*
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RESTRICTED - ATTORNEYS' EYES ONLY

## CERTIFICATE OF SERVICE

I hereby certify that on this day, I served a true and correct copy of the foregoing **DEFENDANT'S RESPONSES TO PLAINTIFF'S INTERROGATORIES (1-25)** on all counsel of record by electronic mail delivery as follows:

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This 3rd day of July, 2023.

*/s/ Seth K. Trimble*
Seth K. Trimble

*Attorney for Defendant*
*Mueller Systems, LLC*

# EXHIBIT P

**REDACTED IN ITS ENTIRETY**

# EXHIBIT Q

UNITED STATES PATENT AND TRADEMARK OFFICE

P.O. Box 1450
Alexandria, VA 22313 - 1450
www.uspto.gov

# ELECTRONIC ACKNOWLEDGEMENT RECEIPT

| APPLICATION # | RECEIPT DATE / TIME | ATTORNEY DOCKET # |
|---|---|---|
| 17/981,454 | 02/28/2025 02:10:09 PM Z ET | 71002.01 |

## Title of Invention

Water Meter and Leak Detection System

## Application Information

| | | | |
|---|---|---|---|
| APPLICATION TYPE | Utility - Nonprovisional Application under 35 USC 111(a) | PATENT # | - |
| CONFIRMATION # | 1349 | FILED BY | Michael Klicpera |
| PATENT CENTER # | 69385811 | FILING DATE | 11/06/2022 |
| CUSTOMER # | 22509 | FIRST NAMED INVENTOR | Michael Edward Klicpera |
| CORRESPONDENCE ADDRESS | - | AUTHORIZED BY | - |

## Documents

**TOTAL DOCUMENTS: 1**

| DOCUMENT | PAGES | DESCRIPTION | SIZE (KB) |
|---|---|---|---|
| Response_Non_Compliant_454_28Feb2025.pdf | 37 | Applicant Arguments/Remarks Made in an Amendment | 9189 KB |

## Digest

| DOCUMENT | MESSAGE DIGEST(SHA-512) |
|---|---|
| Response_Non_Compliant_454_28Feb2025.pdf | 1B4A9883BCF95B1FCAD274F506A71703EE7E8BA9EDDF361035AA08311EB97E94EE976081857A77B5FDCFE95B2C5A3479B565D5803B899F80203B731A25A6CB5C |

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

**New Applications Under 35 U.S.C. 111**

If a new application is being filed and the application includes the necessary components for filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application

**National Stage of an International Application under 35 U.S.C. 371**

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

**New International Application Filed with the USPTO as a Receiving Office**

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

| | |
|---|---|
| In re application of: Klicpera | |
| Serial Number: 17/981,454 | |
| Filed: November 6, 2022 | Art Unit 2863 |
| Examiner: Eric S. Von Wald | |
| For: Water Meter | |
| Attorney Docket Number: 71002.01 | |

Mail Stop Amendments
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Transmitted herewith is an amendment for entry in the above identified patent application.

√ Response to Non-Compliant or Non-Responsive Amendment

28th day of February 2025.

Respectfully submitted,

/Michael E. Klicpera/

Attorney for Applicant
Registration No. 38,044

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

| | | |
|---|---|---|
| In re application of: Klicpera | ) | |
| | ) | |
| Serial Number: 17/981,454 | ) | |
| | ) | Art Unit |
| Filed: November 6, 2022 | ) | 2863 |
| | ) | |
| Examiner: Eric S. Von Wald | ) | |
| | ) | |
| For: Water Meter | ) | |
| | ) | |
| | ) | |
| | ) | |
| Attorney Docket Number: 71002.01 | ) | |

This response to the non-compliant amendment utilizes the claims submitted on November 17, 2024, and January 24, 2025 (and in some cases August 8, 2024), addresses the non-compliant issues and makes certain modifications to this set of claims.

This present set of claims completely replaces the any and all of previous set of claims submitted to the USPTO.

CLAIMS

1. (currently amended) A water meter comprising:

a base station interposed between a main water supply line for [[a]] one or more buildings or structures ~~building or structure~~ and a water supply from a water source provider;

the base station further comprising:

a) an electrical circuitry including at least one of a CPU, a microprocessor, or a microcontroller, or any combinations thereof;

b) [[a]] one or more flow rate sensors ~~electrically~~ connected to the electrical circuitry;

c) a power source electrically connected to the electrical circuitry;

d) the one or more flow rate sensors configured to ~~send~~ sense and monitor ~~the flow of water~~ water flow through the main water supply line;

e) a memory including instructions that, when executed, by the at least one of the CPU, the microprocessor or the microcontroller, or any combination thereof, (i) ~~configures~~ performs monitoring or calculating of water data for one or more buildings or structures, the water data comprising [[the]] one or more water flow rate uses, one or more water

use durations, or one or more total water volumes, or any combinations thereof~~, or (ii) monitors water energy use~~;

f) [[the]] one or more wireless communication transceivers, ~~comprising~~ wherein at least one of the one or more wireless communication transceivers are configured to communicate via:

a wireless network protocol based on an IEEE 802.11 standard;

an infrared light transmission scheme;

a low power and long-range chirp spread modulation technology;

a network using low power and long-range chirp spread modulation technology;

a wireless technology that transmits over a very narrow spectrum;

an Internet Protocol with a sub-1 GHz frequency;

a network is based on a star topology network with master and slave devices described in the EN 13757 standard which comprise operating modes S, T, R and C (868 MHz), F (433 MHz), and W (169MHz);

an interoperable implementation of an IEEE 802.16 family of wireless-networks standards;

a network that uses a compatible smart speaker technology that provides cloud connectivity for the internet of things (IoT) and utilizes low-bandwidth and long-range connectivity;

a third-generation wireless mobile telecommunications technology;

a fourth-generation wireless mobile telecommunications technology;

a fifth-generation wireless mobile ~~telecommunication~~ telecommunications technology;

or any combination thereof;

~~wherein the wireless mobile telecommunication technology is configure to download an Embedded subscriber Identity Module (eSIM) code.~~

g) ~~the power source comprises a Power over Ethernet (PoE) configured as IEEE 802.3af, and IEEE802.3at or an IEEe 802.3bt source, or any combination thereof, the Power over Ethernet (PoE) allow a single electrical cable to upload water data and simultaneously provide electrical power to the base station;~~ wherein [[said]] the one or more wireless communication ~~technologies~~ transceivers utilizes an authentication technology or an encryption ~~technologies~~ technology, or any combination thereof, ~~to prevent unauthorized access, spoofing or eavesdropping of the transmitted~~ when transmitting water data ~~or information~~, or receiving a signal or command;

wherein ~~at least one of the CPU, the microprocessor, [[and]] or the microcontroller with~~ when the one or more flow rate sensors detects the initiation of a water flow, the at least one of the CPU, the microprocessor [and] or the microcontroller, or any combination thereof, instructs the one or more water flow rate ~~sensor~~ sensors to initiate monitoring or [[to]] increase the sampling rate ~~at a sufficient frequency to monitor at least one or more of a water flow rates, or more water use durations, or one or more total volumes until the water stops defining~~ to define [[a]] the one or more water flow ~~event~~ events;

~~wherein the Power over Ethernet (PoE) is configured to, via an application programming interface, (API), (i) upload from the base station to one or more remote computers systems or to one or more electronic communication devices, the water data and (ii) receive a signal or command from the one or more remote computers systems or to one or more electronic communication devices.~~

wherein ~~the base station transfers~~ the water data is transmitted ~~the one or more wireless technology~~ to a remote computer or a cloud service company ~~can~~ utilizing an application programming interface (API).

2. (currently amended) The water meter as recited in ~~claim~~ Claim 1, further comprising a water control valve mechanism, the water control valve mechanism including ~~comprising~~ at least one of {{an}} a ball valve ~~water control valve mechanism~~, a solenoid valve, a piston valve, a variable open design water control valve ~~mechanism~~, a gate valve or a three-way water control valve

~~mechanism~~, said water control valve mechanism connected to the electrical circuitry.

3. (currently amended) The water meter as recited in Claim 1, wherein the application programming interface (API) comprises at least one of (i) a direct internet message encapsulation (ii) a simple object ~~assess~~ access protocol, (iii) a representational state transfer and an architectural style for distributed hypermedia systems, ~~(iv) a HTTP data message to an unsolicited HTTP request,~~ [[(v)]] (iv) a platform that uses a Java development kit to facilitate communication between APPs and external services over HTTP, [[(vi)]] (v) a document object module that is written in JavaScript that uses Java to handle operations of a web document, [[(vii)]] (vi) a simple event-driven algorithm for parsing XML documents [[(viii)]] (vii) a bidirectional read/write event-based method for parsing XML documents, [[(ix)]] (viii) an extensible markup language application programming interface and other application programming interface protocols that provides at least one of a control system architecture, or any combination thereof.

4. (currently amended) The water meter ~~and leak detection system~~ as recited in Claim 2, further comprising a pressure sensor, the memory further including ~~instruction~~ instructions that, when executed by the at least one of the CPU, the microprocessor or the microcontroller, or any combination thereof, perform, based on pressure data from the pressure sensor: (i) detecting one or more water patterns, water signature and leak conditions or (ii) monitoring pressure changes when the base station closes the water control valve mechanism, or any combinations thereof.

5. (currently amended) ~~A water meter as recited in Claim 1, wherein the Power over Ethernet (PoE) technology is hard-wired to a communication hub that is hard wired or utilizes a wirelessly communicates to with (1) the internet (ii) a residential or corporate router, or (iii) a corporation or public network, or any combination thereof, is configured to upload from the base station to the one or more remote computers or one or more electronic communication devices the water data or receive the command or signal from one or more of the remote computers or the one or more electronic communication devices. wherein the memory further includes instructions that, when executed by at least one of the CPU, the microprocessor or the microcontroller, or any combination thereof, performs, based on temperature data from the temperature sensor, that the temperature is approaching a freezing point of 32 degrees Fahrenheit or 0 degrees Celsius, (i) sending a freeze warning message to the one or more remote computer systems or the one or more electronic communication devices, or (ii) initiate a water freeze protection procedure that includes draining the main water supply line, or replacing the water in the water line with an air, a nitrogen, or another gas or liquid having a low freezing point, or any combination thereof.~~ The water meter as recited in Claim 1, further comprising a temperature sensor.

6. (currently amended) The water meter ~~and leak detection system~~ as recited in Claim 1, ~~wherein~~ further comprising [[the]] that at least one of the CPU, the microprocessor, or the microcontroller, or any combination thereof, ~~include~~ includes a software program that ~~monitor and record one or more water flow rate events and~~ performs a water use device calibration mode, wherein the water use device calibration mode ~~commands to be activated,~~ informs a user to activate a

water use device, fixture, or appliance, monitors and records one or more water flow events, and utilizes at least one of a software calculation, an algorithm, or an artificial intelligence to establish a water signature or a water pattern in identifying ~~specific~~ the water use ~~devices,~~ device, ~~fixtures,~~ fixture or ~~appliances~~ appliance.

7. (currently amended) ~~The water meter as recited in Claim 1, wherein the application programming interface (API) comprises at least one of (i) a direct internet message encapsulation (ii) a simple object assess protocol, (iii) a representational state transfer and an architectural style for distributed hypermedia systems, (iv) a HTTP data message to an unsolicited HTTP request, (v) a platform that uses a Java development kit to facilitate communication between APPs and external services over HTTP, (vi) a document object module that is written in JavaScript that uses Java to handle operations of a web document, (vii) a simple event-driven algorithm for parsing XML documents (viii) a bidirectional read/write event-based method for parsing XML documents, (ix) an extensible markup language application programming interface and other application programming interface protocols that provides at least one of a control system architecture, or any combination thereof.~~ The water meter ~~and leak detection system~~ as recited in Claim 1, ~~wherein~~ further comprising [[the]] that at least one of the CPU, the microprocessor, or the microcontroller, or any combination thereof, ~~include~~ includes a software program that ~~monitor and records one or more water flow rate events and~~ performs [[a]] an automatic learning mode, wherein the automatic learning mode ~~activates~~ implements a period of self-leaning, ~~a water use device, fixture, or appliance,~~ monitors and records one or more water flow events, and

utilizes at least one of a software calculation, an algorithm, or an artificial intelligence to ~~established~~ establish a water ~~signatures~~ signature or a water ~~patterns~~ pattern in identifying ~~specific~~ water use devices, [[a]] fixtures, or [[an]] appliances.

8. (currently amended) The water meter as recited in Claim 2, wherein the base station is configured to receive the ~~command or~~ signal or command from [[the]] a one or more electronic communication devices to transmit the water data, close the water control valve mechanism, or to perform a leak detection analysis, or any combination thereof.

9. (currently amended) ~~The water meter as recited in Claim 2, wherein the base station is configured to receive the signal or command from the electronic device to transmit the water data, close the water control valve mechanism, to perform a leak detecting analysis, or any combination thereof.~~

~~The water meter and leak detection system as recited in Claim 1, further comprising the at least one of the CPU, the microprocessor can at least include one of a programming setting managed by a user to remotely establish a mode setting, or modify a default setting processed by a manufacturing factory to:~~

~~a) record the water flow event to a local memory module or a removable memory device for subsequent analysis,~~

~~b) combine a plurality of water flow events into a local memory module and subsequently schedule the transfer of the series of~~

~~water flow events to a remote computer or server., or to a cloud service company,~~

~~c) directly and immediately transfer the water flow event to a remote computer or server, or to a cloud service company, or~~

~~d) transfer the water flow data utilizing a blockchain format to one or more remote computers or servers, or cloud service company.~~

The water meter as recited in Claim 1, wherein the one or more wireless communication transceivers are configured to transmit the water data or receive the information, the signal or command, or any combination thereof, utilizing blockchain technology.

10. (currently amended) A water meter ~~and leak detection system~~ comprising:

a collection node interposed between a main water supply line for one or more buildings or structures ~~building or structure~~ and a water supply from a water source provider;

said collection node further comprising;

a) an electrical circuitry including at least one of a CPU, a microprocessor, or a microcontroller, or any combination thereof;

b) a one or more flow rate sensors ~~configured to sence the water flow through the main water supply line~~ electrically connected to the electrical circuitry;

c) a power source that is electrically connected to said electrical circuitry;

d) the one or more flow rate sensors configured to [[send]] sense and monitor ~~the water~~ water flow through the main water supply line;

e) a memory including instructions that, when executed, by the at least one of the CPU, the microprocessor or the microcontroller, or any combination thereof, (i) ~~configures~~ performs monitoring or calculating of water data for [[the]] one or more water flow rate uses, one or more water durations, or one or more total water volumes, or any combinations thereof~~, (ii) monitors water energy use, or any combination thereof~~;

f) one or more wireless communication transceivers, wherein at least one of the one or more wireless communication transceivers are configured to communicate via:

a wireless network protocol based on an IEEE 802.11 standard;

an infrared light transmission scheme;

a low power and long-range chirp spread modulation technology;

a network using low power and long-range chirp spread modulation technology;

a wireless technology that transmits over a very narrow spectrum;

an Internet Protocol with a sub 1GHz frequency;

a network is based on a star topology network with master and slave devices described in the EN 13757 standard which comprise operating modes S, T, R and C (868 MHz), F (433 MHz) and W (169MHz);

an interoperable implementation of an IEEE 802.16 family of wireless-networks standards;

a network that uses a compatible smart speaker technology that provides cloud connectivity for the internet of things (IoT) and utilizes low-bandwidth and long-range connectivity;

a third-generation wireless mobile telecommunications technology;

a fourth-generation wireless mobile telecommunications technology;

a fifth-generation wireless mobile ~~telecommunication~~ telecommunications technology;

or any combination thereof;

g) wherein the one or more [[first]] wireless communication ~~technologies~~ transceivers utilize an authentication or an encryption technologies, or any combination thereof, ~~to prevent unauthorized access, spoofing or eavesdropping of the water flow use data, the water energy use data, the~~

~~water quality data and leak detection information and information or transmitting signals or commands~~ when transmitting the water data or receiving a signal or command;

~~a one or more communication hubs or the one or more repeater apparatuses having one or more wireless communication technology that corresponds to the one or more wireless communication technology of the collection node, wherein the one or more communication hubs function to extend the range of wireless communication technology or enable meshing technology;~~

the collection node is configured to communication with one or more communication hubs that function to extend a wireless range of the one or more wireless communication transceivers;

the one or more communication hubs perform as a repeater device or provide a mesh technology, or any combination thereof;

the one or more communication hubs ~~or the one or more repeater apparatus~~ having a second electrical circuitry including at least one of a second CPU, a second microprocessor, or a second microcontroller, [[and]] wherein the second electrical circuitry includes a second power source;

the one or more communication hubs ~~or one or more repeater apparatus~~ includes a second wireless communication transceiver that ~~can communicate~~ communicates with [a] an internet connection, a remote computer, a private network, [[or]] a corporate network, or a cloud service company, or any combination thereof;

wherein ~~the transfer the one or more wireless transceivers~~ the water data is transmitted to a remote computer or the cloud service company [[can]] utilizing an application programming interface (API).

11. (currently amended) ~~The water meter as recited in Claim 1, further comprising a temperature sensor in close proximity to the main water supply~~ The water meter as recited Claim 10, further comprising a water control valve mechanism, the water valve control mechanism including at least one of a ball valve ~~water control valve mechanism~~, a solenoid valve, a piston valve, a variable open design water control valve ~~mechanism~~, a gate valve or a three-way water control valve ~~mechanism~~, said water control valve mechanism connected to the electrical circuitry.

12. (currently amended) ~~The water meter as recited in Claim 11, wherein the memory further including instructions that, when executed by at least one of the CPU, the microprocessor or the microcontroller, or any combination thereof, perform, based on the temperature data from the temperature sensor that the temperature is approaching a freezing point of 32 degrees Fahrenheit or 0 degrees Celsius, (i) sending a freeze warning message to a one or more remote computers or a one or more electronic communication devices,(ii) communicating with an intelligent thermostat with wireless technology to turn on a heating system for the one or more buildings or structures, or (iii) initiate a water freeze protection procedure that includes draining the main water supply line, or replacing the water in the main water line with an air, a nitrogen, or another gas or liquid having a low freezing point, or any combination thereof.~~ The water meter ~~and leak detection system~~ as recited in Claim 10, wherein the application programming interface (API)

comprises at least one of (i) a direct internet message encapsulation (ii) a simple object ~~assess~~ access protocol, (iii) a representational state transfer and an architectural style for distributed hypermedia systems, ~~(iv) a HTTP data message to an unsolicited HTTP request,~~ [[(v)]] (iv) a platform that uses a Java development kit to facilitate communication between APPs and external services over HTTP, [[(vi)]] (v) a document object module that is written in JavaScript that uses Java to handle operations of a web document, [[(vii)]] (vi) a simple event-driven algorithm for ~~lexing or~~ parsing XML documents [[(viii)]] (vii) a bidirectional read/write event-based method for ~~lexing or~~ parsing XML documents, [[(ix)]] (viii) an extensible markup language application programming interface and other application programming interface protocols that provides at least one of a control system architecture, or any combination thereof.

13. (currently amended) ~~The water meter and leak detection system as recited in Claim 10,~~ The water meter as recited in Claim 1, ~~wherein~~ further comprising [[the]] one or more electronic communication devices ~~comprises using~~ that include at least one of a smart cell phone, a mobile phone, a PDA, a tablet, a remote computer or server, a web portal, a smart or internet capable television, a wireless smartwatch, an remote computer operation center, or an another electronic communication apparatus or any combination thereof, wherein the electronic communication devices are configured to communicate with a one or more remote computers or a cloud service company, or any combination thereof.

14. (currently amended) ~~The water meter and leak detection system as recited in Claim 10, further including at least one of a mesh and a peer-to-peer technology circuitry wher the mesh and~~

~~the peer-to-peer technology enables on or more repeater apparatuses to communicate with a one or more water meter collection nodes;~~ The water meter as recited in Claim 10, further comprising an acoustic sensor, the memory further including instruction that, when executed by at least one of the CPU, the microprocessor, or the microcontroller, or any combination thereof, perform, based on one or more signals from the acoustic sensor, ~~identifying~~ identifies one of more water control valves or a leak condition.

15. (currently amended) ~~The water meter and leak detection system as recited in Claim 1, wherein at least one of the CPU, the microprocessor, or the microcontroller and any combination thereof, enters into a sleep mode between at least one of a water flow event, a leak test, transmitting or receiving the signal or command, and any combination thereof. The water meter and leak detection system as recited in Claim 10, including at least one of a mesh or a peer-to-peer technology circuitry, or any combination thereof, where the mesh or the peer-to-peer technology enables the one or more communication hubs or the one or more repeater apparatuses to communicate with a one or more water meter collection nodes.~~ The water meter as recited in Claim 10, further comprising one or more electronic communication devices that include at least one of a smart cell phone, a mobile phone, a PDA, a tablet, a remote computer or server, a web portal, a smart or internet capable television, a wireless smartwatch, an remote computer operation center, or an another electronic communication apparatus or any combination thereof, wherein the electronic communication devices are configured to communicate with a one or more remote computers or a cloud service company, or any combination thereof.

16. (currently amended) The water meter ~~and leak detection system~~ as recited in Claim 10, further comprising one or more water quality sensors configured to periodically monitor at least one of a pH, halogen, total dissolved solids, biological or fecal contamination, water hardness, metallic ion or any combination thereof.

17. (currently amended) The water meter ~~and leak detection system~~ as recited in Claim 10, wherein ~~the one or more wireless transceiver of collection node and the second wireless transceiver communication hub is configured to transmit a water data using blockchain technology.~~ the one or more wireless transceivers and the second wireless transceiver are configured to transmit water data, or receive the information, the signal or command, or any combination thereof, utilize blockchain technology.

18. (currently amended) The water meter as recited in claim 10, further comprising ~~a communication hub~~ that one or more collection nodes and a one or more communication hubs form or configure a private network or a corporate network that utilizes an application programming interface (API) when communicating with the remote computer system, a cloud service company, or the electronic communication device, or any combination thereof.

19. (currently amended) The water meter ~~and leak detection system~~ as recited in Claim 10, ~~wherein~~ further comprising that at least one of the CPU, the microprocessor, or the microcontroller, or any combination thereof, includes a software program that ~~monitors one or more flow events and~~ performs a water use device calibration mode, wherein the water use device calibration mode ~~commands~~ informs a user to

activate a water use device, fixture, or appliance ~~to be activated~~, [[and]] monitors and records one or more water flow events, ~~a water signature or a water pattern~~ and utilizes at least one of a software calculation, an algorithm, or an artificial intelligence to established water signatures or water patterns in identifying specific water use ~~devices, fixtures, or appliances~~ a water use device, fixture, or appliance.

20. (currently amended) The water meter ~~and leak detection system~~ as recited in Claim 10, ~~wherein~~ further comprising that at least one of the CPU, the microprocessor, or the microcontroller, or any combination thereof, ~~include~~ includes a software program that ~~monitors and records one or more water flow event to~~ performs an automatic learning mode, wherein the automatic learning mode ~~performs~~ executes a period of self-learning, monitors and records one or more flow events, and utilizes at least one of a software calculation, an algorithm or an artificial intelligence to established water signatures or water patterns in identifying specific water use devices, a fixtures, or an appliances.

21. (currently amended) A water meter comprising:

a base station interposed between a main water supply line for a ~~building or structure~~ one or more buildings or structures and a water supply from a water source provider;

the base station further comprising:

a) an electrical circuitry including at least one of a CPU, a microprocessor, or a microcontroller, or any combination thereof;

b) a power source electrically connected to the electrical circuitry, the power source obtained from an electrical supply ~~from~~ over a Power over Ethernet (PoE);

c) a one or more water flow rate sensors configured to sense and monitor ~~the flow of water~~ water flow through the main water supply line;

e) a memory including software instructions that, when executed by [[the]] at least one of the CPU, the microprocessor, or the microcontroller, or any combination thereof, perform monitoring or ~~calculations~~ calculating ~~of~~ a water data for the one or more buildings or structures, the water data comprising at least one of more water flow rate use, water use durations, total water volumes, or water energy use, or any combination thereof; and

wherein the water data is transferred to an internet connection via a Power over the Ethernet (PoE).

~~wherein the Power over Ethernet (PoE) is configures to via an application programming interface (API), (i) upload from the base stations to one or more remoter computers systems or to one or more electronic communication devices, the water data and (i) receive a signal or command from the one or more remoter computers systems or to one or more electronic communication devices~~

22. (currently amended) The water meter as recited in claim 21, further comprising a water control valve mechanism ~~comprising~~ including at least one of a ball valve, solenoid valve, piston valve, a variable open design valve, a three-way valve, or gate valve, or any combination thereof.

23. (withdrawn) The water meter as recited in Claim 21, the Power over Ethernet (PoE) allow a signal cable to upload the water data and simultaneously provide electric power to the base station.

24. (currently amended) The water meter as recited in Claim 21, further including one or more rechargeable batteries that are supplemented with electrical energy by a hardwired IEEE PoE 802.3af, IEEE 802.3at, or IEEE 803.2bt source, or any combination thereof.

25. (currently amended) The water meter as recited in Claim 21, wherein the Power over Ethernet (PoE) [cable] provides a direct connection to an internet connection through a residential or corporate router, or to a corporate or public network, or any combination thereof, and is configured to utilize an application programming interface (API) ~~(i) upload from the base station to a remote computer system the water data and (ii)) receive the signal or command from the one r more of the remote computer systems or the one or more electronic communication devices~~.

26. (currently amended) The water meter as recited in Claim 21, further comprising ~~the collection node communicates with a communication hub, wherein the~~ a communication hub that is connected by hard-wire to [[a]] the Power over Ethernet (PoE)

~~technology or~~ wherein the communication hub utilizes a one or more wireless transceivers to communicate with (i) a residential or corporate router for access to the internet, or (ii) to a corporation or a public network, or any combination thereof, [[,]] ~~is configured to upload from the base station to the one or more remote computers or one or more electronic communication devices the water data or receive the command or signal from one or more of the remote computers or the one or more electrionic communication devices.~~

27. (currently amended) The water meter [[are]] as recited in Claim 26, wherein the communication hub ~~utilizes the~~ includes one or more wireless communication transceivers, wherein at least one of the one or more wireless communication transceivers are configured to communicate via:

a wireless network protocol based on an IEEE 802.11 standard;

an infrared light transmission scheme;

a low power and long-range chirp spread modulation technology;

a network using the low power and long-range chirp spread modulation technology;

a wireless technology that transmits over a very narrow spectrum;

an Internet Protocol (IPv6) with a sub-1 GHz frequency;

a network is based on a star topology network with master and slave devices described in the EH 13757 standard which comprises operating modes S, T, R and C (868 MHz), F (433 MHz), and W (169 MHz);

an interoperable implementation of an IEEE 802.16 family of wireless-networks standards;

a network that uses a compatible smart speaker technology that provides cloud connectivity for [the] an internet of things (IoT) and utilizes low-bandwidth and long-range connectivity;

a third-generation wireless mobile telecommunications technology;

a fourth-generation wireless mobile telecommunications technology;

a fifth-generation wireless mobile ~~telecommunication~~ telecommunications technology;

or any combination thereof[[;]].

28. (currently amended) The water meter as recited in Claim 21, wherein when ~~at least one of the CPU, the microprocessor, or the microcontroller with~~ the one or more flow rate sensors detects the initiation of a water flow, the at least one of the CPU, the microprocessor, [[and]] or the microcontroller, or any combination thereof, instructs the water flow rate sensor to initiate monitoring or increase the sampling rate ~~at a~~

~~sufficient frequency capable to monitor at least one or more of a water flow rates, or more water use durations, or one or more total volumes or any combination thereof, until water flow stops defining~~ to define [[a]] the one or more water flow ~~event~~ events [[;]].

29. (currently amended) The water meter as recited in Claim 25, wherein the application programming interface (API) comprises at least one of i) a direct internet message encapsulation (ii) a simple object ~~assess~~ access protocol, (iii) a representational state transfer and an architectural style for distributed hypermedia systems, (iv) a platform that uses a Java development kit to facilitate communication between APPs and external services over HTTP, (v) a document object module that is written in JavaScript that uses Java to handle operations of a web document, (vi) a simple event-driven algorithm for ~~lexing and~~ parsing XML documents (vii) a bidirectional read/write event-based method for ~~lexing and~~ parsing XML documents, (viii) an extensible markup language application programming interface and other application programming interface protocols that provides at least one of a control system architecture, or any combination thereof.

30. (currently amended) The water meter as recited in Claim 22, further comprising a pressure sensor, the memory further including ~~instruction~~ instructions that, when executed by the at least one of the CPU, the microprocessor or the microcontroller, or any combination thereof, perform, based on pressure data obtained from the pressure sensor, (i) detecting one or more water patterns, water signatures, or leak conditions, or (ii) monitoring pressure changes when the base station closes the water control valve mechanism, or any combinations thereof.

31. (currently amended) The water meter as recited in Claim [[21]] 22, wherein the base station is configured to receive [the] a signal or command from one or more remote computers or one or more electronic ~~device~~ communication devices to transmit the water data, close the water control valve mechanism, to perform a leak detection analysis, or any combination thereof.

32. (previously presented) The water meter as recited in Claim 21, wherein the base station is configured to provide a registered user, owner or a monitoring facility, or any combination thereof, a warning or signal to one or more remote computer systems or to one or more electronic communication devices, in response to detecting a leak condition.

33. (currently amended) The water meter as recited in Claim 21, further comprising a temperature sensor ~~in close proximity to the main water supply~~.

34. (previously presented) The water meter as recited in Claim 33, wherein the memory further including instructions that, when executed by at least one of the CPU, the microprocessor or the microcontroller, or any combination thereof, perform, based on the temperature data from the temperature sensor that the temperature is approaching a freezing point of 32 degrees Fahrenheit or 0 degrees Celsius, (i) sending a freeze warning message to a one or more remote computers or a one or more electronic communication devices, (ii) communicating with an intelligent thermostat with wireless technology to turn on a heating system for the one or more buildings or structures, or (iii) initiate a water freeze protection procedure that includes draining the main water supply line, or replacing the

water in the main water line with an air, a nitrogen, or another gas or liquid having a low freezing point, or any combination thereof.

35. (currently amended) The water meter as recited in Claim 21, ~~wherein~~ further comprising one or more electronic communication devices that are configured to communicate with a one or more remote computers or a cloud service company, the one or more electronic communication devices includes ~~comprise using~~ at least one of a smart cell phone, a mobile phone, a PDA, a tablet, a remote computer or server, a web portal, a smart or internet capable television, a wireless smartwatch, an remote computer operation center, or an another electronic communication apparatus or any combination thereof.

36. (previously presented) The water meter as recited in Claim 21, further comprising an acoustic sensor, the memory further including instructions that, when executed by at least one of the CPU, the microprocessor, or the microcontroller, or any combination thereof, perform, based on acoustic data obtained from the acoustic sensor, identifying one of more water appliances or faucets water control valves or the leak condition.

37. (previously presented) The water meter as recited in Claim 21, wherein at least one of the CPU, the microprocessor, or the microcontroller or any combination thereof, enters into a sleep mode between at least one of a water flow event, a leak detecting test, or receiving the signal or command, or any combination thereof.

38. (previously presented) The water meter as recited in Claim 21, further comprising one or more water quality sensors

configured to periodically monitor at least one of a pH, halogen, total dissolved solids, biological or fecal contamination, water hardness, metallic ion or any combination thereof.

39. (currently amended) The water meter as recited in Claim [[21]] 27, ~~is configured to transmit a water data using blockchain technology~~ wherein the one or more wireless transceivers are configured to transmit water data, or receive the information, the signal or command, or any combination thereof, utilize blockchain technology.

40. (currently amended) ~~the water meter as recited in claim 26. Wherein the communication hub with wireless transceiver to configure a private network or a corporate network that utilizes an application programming interface (API) when communicating with the one or more remote computer systems or the one or more electronic communication devices.~~ The water meter as recited in Claim 21, further comprising at least one of the CPU, the microprocessor, or the microcontroller, or any combination thereof, that includes a software program that performs a water use device calibration mode, wherein the water use device calibration mode informs a user to activate a water use device, fixture, or appliance, monitors and records one or more water flow events, and utilizes at least one of a software calculation, an algorithm, or an artificial intelligence to establish a water signature or a water pattern in identifying the water use device, fixture, or appliance.

41. (currently amended) The water meter ~~and leak detection system~~ as recited in Claim 21, further comprising at least one of the CPU, the microprocessor, or the microcontroller, or

any combination thereof, that includes a software program that performs an automatic learning mode, wherein the automatic learning mode implements a period of self-learning, monitors and records one or more water flow events, and utilizes at least one of a software calculation, an algorithm or an artificial intelligence to establish a water signature or a water pattern in identifying ~~specific~~ water use devices, [[a]] fixtures, or [[an]] appliances.

42. (currently amended) ~~The water meter and leak detection system as recited in Claim 21, further comprising at least one of the CPU, the microprocessor, or the microcontroller, or any combination thereof, includes a software program that performs an automatic learning mode, wherein the automatic learning mode implements a period of self-learning, monitors and records one or more water flow events, and utilizes at least one of a software calculation, an algorithm or an artificial intelligence to establish a water signature or a water pattern in identifying specific water use devices, a fixtures, or an appliances.~~ The water meter as recited in Claim 5, wherein the memory further includes instructions that, when executed by at least one of the CPU, the microprocessor or the microcontroller, or any combination thereof, performs, based on temperature data from the temperature sensor, that the temperature is approaching a freezing point of 32 degrees Fahrenheit or 0 degrees Celsius, (i) sending a freeze warning message to the one or more remote computer systems or the one or more electronic communication devices, or (ii) initiate a water freeze protection procedure that includes draining the main water supply line, or replacing the water in the water line with an air, a nitrogen, or another gas or liquid having a low freezing point, or any combination thereof.

43. (new) The water meter as recited in Claim 10, further comprising a temperature sensor.

44. (new) The water meter as recited in Claim 43, wherein the memory further includes instructions that, when executed by at least one of the CPU, the microprocessor or the microcontroller, or any combination thereof, performs, based on temperature data from the temperature sensor, that the temperature is approaching a freezing point of 32 degrees Fahrenheit or 0 degrees Celsius, (i) sending a freeze warning message to the one or more remote computer systems or the one or more electronic communication devices, or (ii) initiate a water freeze protection procedure that includes draining the main water supply line, or replacing the water in the water line with an air, a nitrogen, or another gas or liquid having a low freezing point, or any combination thereof.

45. (new) The water meter as recited in Claim 1, wherein the base station is configured to provide a registered user, owner or monitoring facility, or any combination thereof, a warning or signal to a one or more remote computer systems or to a one or more electronic communication devices, in response to detecting a leak condition.

46. (new) The water meter as recited in Claim 10, wherein the base station is configured to provide a registered user, owner or monitoring facility, or any combination thereof, a warning or signal to a one or more remote computer systems or to a one or more electronic communication devices, in response to detecting a leak condition.

47. (new) The water meter as recited in claim 21, wherein the Power over Ethernet (PoE) is configured to (i) transfer from the base station to one or more remote computer systems, a cloud service company, or to a one or more electronic communication devices, a water data and (ii) receive a signal or command from one or more of the remote computer systems, a cloud service company or one or more electronic communication devices.

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Response to Non-compliant Claims

The Applicant has withdrawn 1 claim and added three (3) new claims and marked accordantly. The Applicant will pay for the additional 2 claims with the filing of this Response.

The Examiner stated that Claim 1 reincorporates the limitations of bullet point "f' of "the one or more wireless communication transceivers comprising" without underlining the limitation. Claim 1 also failed to cancel the last "wherein" clause of previously filed Claim 1 in the amended Claim 1.

Response:

The Applicant has underlined "the one or more wireless communication transceivers wherein" and included the cancelled ast "wherein" clause and therefore, addressed the objections that the Examiner had defined and believes the issue is now resolved. The Applicant also noticed that he failed to cancel previous August 8, 2023 clause in section G and has correct this as well.

The Examiner stated that Claim 5 recites all new claim limitations without cancelling any of the previously amended limitations.

Response:

The Applicant has addressed the objection by including the cancelled amended limitations from the August 8, 2024 submission

and then the cancelled amended limitations from the November 17, 2024 submission, and therefore, addressed the objections the Examiner had defined and the Applicant believes the issue is now resolved.

The Examiner stated that Claim 7 cancels all of the limitations of the originally examined claim set, but fails to cancel any and all of the amended claim set as presented previously, while also presenting new limitations.

Response:

The Applicant has addressed the objection by including the correct cancelled amended limitation from the August 8, 2024 submission that the Examiner had defined and believes the issue is now resolved.

The Examiner stated that Claim 9 fails to cancel any and all of the claim limitations as provided in the previous response and has instead provided the originally examined limitations without showing anything canceled.

Response:

The Applicant has addressed the objection by including the cancelled amended limitations from the August 8, 2024 submission and then the cancelled amended limitations from the November 17, 2024 submission that the Examiner had defined and the Applicant believes the issue is now resolved.

The Examiner stated that Claim 10 fails to cancel any and all limitations from the previously amended response and has instead included new limitations.

Response:

The Applicant has addressed the objection by including the cancelled amended limitation from the August 8, 2024 submission that the Examiner had defined and believes the issue is now resolved.

The Examiner stated that Claim 11 has been amended without canceling the previously disclosed limitations presented in the previous response.

Response:

The Applicant has addressed the objections by cancelling the correct previously disclose limitations from the August 8, 2024 submission that the Examiner had defined and the Applicant believes the issue is now resolved.

The Examiner stated that Claim 12 had re-cancelled the same amendments that were already cancelled from the originally examined claims. The Examiner also stated that Claim 12 is also defective in further failing to cancel the newly added limitations from claim 12 presented in the previous response.

Response:

The Applicant has addressed the objections by cancelling the previously added limitations from the August 8, 2024 submission and make corrections to the limitations from the November 17, 2024 submission that the Examiner has defined and the Applicant believes the issue is now resolved.

The Examiner stated that Claim 13 claims correspondence back to both claims 10 and 1. Further, claim 13 is amended to include the exact same subject matter as the previous response, but also fails to cancel the amended limitations of the previous response.

Response:

The Applicant has addressed the objection by deleted the correspondence to claim 10 that the Examiner had defined and believes the issue is now resolved.

Response:

The Applicant has addressed the objection that the Examiner has defined and the Applicant believes the issue is now resolved.

The Examiner stated that Claim 14 is amended to include limitations to include depending from claim 10 twice in the same sentence.

Response:

The Applicant has addressed the objection by deleting limitations to depend from only claim 10 once (deleted the

superfluous correspondence to claim 10) that the Examiner had defined and the Applicant believes the issue is now resolved.

The Examiner stated that Claim 15 has been amended without cancelling the previously disclosed limitations from the previous response.

Response:

The Applicant has addressed the objection by cancelling the previously disclose limitations from August 8, 2024 and cancelling the limitations from November 17, 2024 that the Examiner had defined and believes the issue is now resolved.

The Examiner stated that Claim 16 has includes the same limitations which were included in the previous response, but are included as amendments again.

Response:

The Applicant has addressed the objection by removing the underlined limitation and made a correction that the Examiner had defined and the Applicant believes the issue is now resolved.

The Examiner stated that Claim 18 purports to originally depend from claim 1. That's incorrect. The previous response disclosed claim 18 as depending from claim 5.

Response:

The Applicant has addressed the objection by purporting to depend on claim 10 that the Examiner had defined and believes the issue is now resolved.

The Examiner stated that Claim 10 incorrectly cancelled the wrong limitations from a previously filing while also incorporating previously amended language as underline/newly disclosed limitations especially see step f) and further).

Response:

The Applicant has addressed the objection by purporting to depend on claim 10 that the Examiner had defined and the Applicant believes the issue is now resolved.

The Examiner stated that Claim 27 is a new claim, yet includes amended language (crossed out), underlined and bracketed, in a new claim.

Response:

The Applicant has addressed the objection by removing all crossed out, underline and bracketed ([the] in paragraph f) in the new claim that the Examiner had defined and the Applicant believes the issue is now resolved.

The Examiner stated that Claim 29 is a new claim, yet includes removed limitations in the same underlined portion.

Response:

The Applicant has addressed the objection by removing the crossed out ~~(vii)~~ that the Examiner has defined and the Applicant believes the issue is now resolved.

The Examiner state the Claims 42-44 are newly added limitations which are disclosed as "previously presented" which in not a correct designator.

Response:

The Applicant has addressed the objection that the Examiner has defined and the Applicant believes the issue is now resolved.

Other non-compliant issues were in Claims 27 and 28 where the claim ended with a ";" instead of a period which is now corrected.

28th day of February 2025.

Respectfully submitted,

/Michael E. Klicpera/

Attorney for Applicant
Registration No. 38,044

This present set of claims completely replaces the any and all of previous set of claims submitted to the USPTO.

CLAIMS

1. (currently amended) A water meter comprising:

a base station interposed between a main water supply line for [[a]] one or more buildings or structures ~~building or structure~~ and a water supply from a water source provider;

the base station further comprising:

a) an electrical circuitry including at least one of a CPU, a microprocessor, or a microcontroller, or any combinations thereof;

b) [[a]] one or more flow rate sensors ~~electrically~~ connected to the electrical circuitry;

c) a power source electrically connected to the electrical circuitry;

d) the one or more flow rate sensors configured to ~~send~~ sense and monitor ~~the flow of water~~ water flow through the main water supply line;

e) a memory including instructions that, when executed, by the at least one of the CPU, the microprocessor or the microcontroller, or any combination thereof, (i) ~~configures~~ performs monitoring or calculating of water data for one or more buildings or structures, the water data comprising [[the]] one or more water flow rate uses, one or more water

use durations, or one or more total water volumes, or any combinations thereof~~, or (ii) monitors water energy use~~;

f) [[the]] one or more wireless communication transceivers, ~~comprising~~ wherein at least one of the one or more wireless communication transceivers are configured to communicate via:

a wireless network protocol based on an IEEE 802.11 standard;

an infrared light transmission scheme;

a low power and long-range chirp spread modulation technology;

a network using low power and long-range chirp spread modulation technology;

a wireless technology that transmits over a very narrow spectrum;

an Internet Protocol with a sub-1 GHz frequency;

a network is based on a star topology network with master and slave devices described in the EN 13757 standard which comprise operating modes S, T, R and C (868 MHz), F (433 MHz), and W (169MHz);

an interoperable implementation of an IEEE 802.16 family of wireless-networks standards;

a network that uses a compatible smart speaker technology that provides cloud connectivity for the internet of things (IoT) and utilizes low-bandwidth and long-range connectivity;

a third-generation wireless mobile telecommunications technology;

a fourth-generation wireless mobile telecommunications technology;

a fifth-generation wireless mobile ~~telecommunication~~ telecommunications technology;

or any combination thereof;

~~wherein the wireless mobile telecommunication technology is configure to download an Embedded subscriber Identity Module (eSIM) code.~~

g) ~~the power source comprises a Power over Ethernet (PoE) configured as IEEE 802.3af, and IEEE802.3at or an IEEe 802.3bt source, or any combination thereof, the Power over Ethernet (PoE) allow a single electrical cable to upload water data and simultaneously provide electrical power to the base station;~~ wherein [[said]] the one or more wireless communication ~~technologies~~ transceivers utilizes an authentication technology or an encryption ~~technologies~~ technology, or any combination thereof, ~~to prevent unauthorized access, spoofing or eavesdropping of the transmitted~~ when transmitting water data ~~or information~~, or receiving a signal or command;

wherein ~~at least one of the CPU, the microprocessor, [[and]] or the microcontroller with~~ when the one or more flow rate sensors detects the initiation of a water flow, the at least one of the CPU, the microprocessor [and] or the microcontroller, or any combination thereof, instructs the one or more water flow rate ~~sensor~~ sensors to initiate monitoring or [[to]] increase the sampling rate ~~at a sufficient frequency to monitor at least one or more of a water flow rates, or more water use durations, or one or more total-volumes until the water stops defining~~ to define [[a]] the one or more water flow ~~event~~ events;

~~wherein the Power over Ethernet (PoE)is configured to, via an application programming interface,(API), (i) upload from the base station to one or more remote computers systems or to one or more electronic communication devices, the water data and (ii) receive a signal or command from the one or more remote computers systems or to one or more electronic communication devices.~~

wherein ~~the base station transfers~~ the water data is transmitted ~~the one or more wireless technology~~ to a remote computer or a cloud service company ~~can~~ utilizing an application programming interface (API).

2. (currently amended) The water meter as recited in ~~claim~~ Claim 1, further comprising a water control valve mechanism, the water control valve mechanism including ~~comprising~~ at least one of {{an}} a ball valve ~~water control valve mechanism~~, a solenoid valve, a piston valve, a variable open design water control valve ~~mechanism~~, a gate valve or a three-way water control valve

~~mechanism~~, said water control valve mechanism connected to the electrical circuitry.

3. (currently amended) The water meter as recited in Claim 1, wherein the application programming interface (API) comprises at least one of (i) a direct internet message encapsulation (ii) a simple object ~~assess~~ access protocol, (iii) a representational state transfer and an architectural style for distributed hypermedia systems, ~~(iv) a HTTP data message to an unsolicited HTTP request,~~ [[(v)]] (iv) a platform that uses a Java development kit to facilitate communication between APPs and external services over HTTP, [[(vi)]] (v) a document object module that is written in JavaScript that uses Java to handle operations of a web document, [[(vii)]] (vi) a simple event-driven algorithm for parsing XML documents [[(viii)]] (vii) a bidirectional read/write event-based method for parsing XML documents, [[(ix)]] (viii) an extensible markup language application programming interface and other application programming interface protocols that provides at least one of a control system architecture, or any combination thereof.

4. (currently amended) The water meter ~~and leak detection system~~ as recited in Claim 2, further comprising a pressure sensor, the memory further including ~~instruction~~ instructions that, when executed by the at least one of the CPU, the microprocessor or the microcontroller, or any combination thereof, perform, based on pressure data from the pressure sensor: (i) detecting one or more water patterns, water signature and leak conditions or (ii) monitoring pressure changes when the base station closes the water control valve mechanism, or any combinations thereof.

5. (currently amended) ~~A water meter as recited in Claim 1, wherein the Power over Ethernet (PoE) technology is hard-wired to a communication hub that is hard wired or utilizes a wirelessly communicates to with (1) the internet (ii) a residential or corporate router, or (iii) a corporation or public network, or any combination thereof, is configured to upload from the base station to the one or more remote computers or one or more electronic communication devices the water data or receive the command or signal from one or more of the remote computers or the one or more electronic communication devices. wherein the memory further includes instructions that, when executed by at least one of the CPU, the microprocessor or the microcontroller, or any combination thereof, performs, based on temperature data from the temperature sensor, that the temperature is approaching a freezing point of 32 degrees Fahrenheit or 0 degrees Celsius, (i) sending a freeze warning message to the one or more remote computer systems or the one or more electronic communication devices, or (ii) initiate a water freeze protection procedure that includes draining the main water supply line, or replacing the water in the water line with an air, a nitrogen, or another gas or liquid having a low freezing point, or any combination thereof.~~ The water meter as recited in Claim 1, further comprising a temperature sensor.

6. (currently amended) The water meter ~~and leak detection system~~ as recited in Claim 1, ~~wherein~~ further comprising [[the]] that at least one of the CPU, the microprocessor, or the microcontroller, or any combination thereof, ~~include~~ includes a software program that ~~monitor and record one or more water flow rate events and~~ performs a water use device calibration mode, wherein the water use device calibration mode ~~commands to be activated,~~ informs a user to activate a

water use device, fixture, or appliance, monitors and records one or more water flow events, and utilizes at least one of a software calculation, an algorithm, or an artificial intelligence to establish a water signature or a water pattern in identifying ~~specific~~ the water use ~~devices,~~ device, ~~fixtures,~~ fixture or ~~appliances~~ appliance.

7. (currently amended) ~~The water meter as recited in Claim 1, wherein the application programming interface (API) comprises at least one of (i) a direct internet message encapsulation (ii) a simple object assess protocol, (iii) a representational state transfer and an architectural style for distributed hypermedia systems, (iv) a HTTP data message to an unsolicited HTTP request, (v) a platform that uses a Java development kit to facilitate communication between APPs and external services over HTTP, (vi) a document object module that is written in JavaScript that uses Java to handle operations of a web document, (vii) a simple event-driven algorithm for parsing XML documents (viii) a bidirectional read/write event-based method for parsing XML documents, (ix) an extensible markup language application programming interface and other application programming interface protocols that provides at least one of a control system architecture, or any combination thereof.~~ The water meter ~~and leak detection system~~ as recited in Claim 1, ~~wherein~~ further comprising [[the]] that at least one of the CPU, the microprocessor, or the microcontroller, or any combination thereof, ~~include~~ includes a software program that ~~monitor and records one or more water flow rate events and~~ performs [[a]] an automatic learning mode, wherein the automatic learning mode ~~activates~~ implements a period of self-leaning, ~~a water use device, fixture, or appliance,~~ monitors and records one or more water flow events, and

utilizes at least one of a software calculation, an algorithm, or an artificial intelligence to ~~established~~ establish a water ~~signatures~~ signature or a water ~~patterns~~ pattern in identifying ~~specific~~ water use devices, [[a]] fixtures, or [[an]] appliances.

8. (currently amended) The water meter as recited in Claim 2, wherein the base station is configured to receive the ~~command or~~ signal or command from [[the]] a one or more electronic communication devices to transmit the water data, close the water control valve mechanism, or to perform a leak detection analysis, or any combination thereof.

9. (currently amended) ~~The water meter as recited in Claim 2, wherein the base station is configured to receive the signal or command from the electronic device to transmit the water data, close the water control valve mechanism, to perform a leak detecting analysis, or any combination thereof.~~

~~The water meter and leak detection system as recited in Claim 1, further comprising the at least one of the CPU, the microprocessor can at least include one of a programming setting managed by a user to remotely establish a mode setting, or modify a default setting processed by a manufacturing factory to:~~

~~a) record the water flow event to a local memory module or a removable memory device for subsequent analysis,~~

~~b) combine a plurality of water flow events into a local memory module and subsequently schedule the transfer of the series of~~

~~water flow events to a remote computer or server., or to a cloud service company,~~

~~c) directly and immediately transfer the water flow event to a remote computer or server, or to a cloud service company, or~~

~~d) transfer the water flow data utilizing a blockchain format to one or more remote computers or servers, or cloud service company.~~

The water meter as recited in Claim 1, wherein the one or more wireless communication transceivers are configured to transmit the water data or receive the information, the signal or command, or any combination thereof, utilizing blockchain technology.

10. (currently amended) A water meter ~~and leak detection system~~ comprising:

a collection node interposed between a main water supply line for one or more buildings or structures ~~building or structure~~ and a water supply from a water source provider;

said collection node further comprising;

a) an electrical circuitry including at least one of a CPU, a microprocessor, or a microcontroller, or any combination thereof;

b) a one or more flow rate sensors ~~configured to sence the water flow through the main water supply line~~ electrically connected to the electrical circuitry;

c) a power source that is electrically connected to said electrical circuitry;

d) the one or more flow rate sensors configured to [[send]] sense and monitor ~~the water~~ water flow through the main water supply line;

e) a memory including instructions that, when executed, by the at least one of the CPU, the microprocessor or the microcontroller, or any combination thereof, (i) ~~configures~~ performs monitoring or calculating of water data for [[the]] one or more water flow rate uses, one or more water durations, or one or more total water volumes, or any combinations thereof~~, (ii) monitors water energy use, or any combination thereof~~;

f) one or more wireless communication transceivers, wherein at least one of the one or more wireless communication transceivers are configured to communicate via:

a wireless network protocol based on an IEEE 802.11 standard;

an infrared light transmission scheme;

a low power and long-range chirp spread modulation technology;

a network using low power and long-range chirp spread modulation technology;

a wireless technology that transmits over a very narrow spectrum;

an Internet Protocol with a sub 1GHz frequency;

a network is based on a star topology network with master and slave devices described in the EN 13757 standard which comprise operating modes S, T, R and C (868 MHz), F (433 MHz) and W (169MHz);

an interoperable implementation of an IEEE 802.16 family of wireless-networks standards;

a network that uses a compatible smart speaker technology that provides cloud connectivity for the internet of things (IoT) and utilizes low-bandwidth and long-range connectivity;

a third-generation wireless mobile telecommunications technology;

a fourth-generation wireless mobile telecommunications technology;

a fifth-generation wireless mobile ~~telecommunication~~ telecommunications technology;

or any combination thereof;

g) wherein the one or more [[first]] wireless communication ~~technologies~~ transceivers utilize an authentication or an encryption technologies, or any combination thereof, ~~to prevent unauthorized access, spoofing or eavesdropping of the water flow use data, the water energy use data, the~~

~~water quality data and leak detection information and information or transmitting signals or commands~~ when transmitting the water data or receiving a signal or command;

~~a one or more communication hubs or the one or more repeater apparatuses having one or more wireless communication technology that corresponds to the one or more wireless communication technology of the collection node, wherein the one or more communication hubs function to extend the range of wireless communication technology or enable meshing technology;~~

the collection node is configured to communication with one or more communication hubs that function to extend a wireless range of the one or more wireless communication transceivers;

the one or more communication hubs perform as a repeater device or provide a mesh technology, or any combination thereof;

the one or more communication hubs ~~or the one or more repeater apparatus~~ having a second electrical circuitry including at least one of a second CPU, a second microprocessor, or a second microcontroller, [[and]] wherein the second electrical circuitry includes a second power source;

the one or more communication hubs ~~or one or more repeater apparatus~~ includes a second wireless communication transceiver that ~~can communicate~~ communicates with [a] an internet connection, a remote computer, a private network, [[or]] a corporate network, or a cloud service company, or any combination thereof;

wherein ~~the transfer the one or more wireless transceivers~~ the water data is transmitted to a remote computer or the cloud service company [[can]] utilizing an application programming interface (API).

11. (currently amended) ~~The water meter as recited in Claim 1, further comprising a temperature sensor in close proximity to the main water supply~~ The water meter as recited Claim 10, further comprising a water control valve mechanism, the water valve control mechanism including at least one of a ball valve ~~water control valve mechanism~~, a solenoid valve, a piston valve, a variable open design water control valve ~~mechanism~~, a gate valve or a three-way water control valve ~~mechanism~~, said water control valve mechanism connected to the electrical circuitry.

12. (currently amended) ~~The water meter as recited in Claim 11, wherein the memory further including instructions that, when executed by at least one of the CPU, the microprocessor or the microcontroller, or any combination thereof, perform, based on the temperature data from the temperature sensor that the temperature is approaching a freezing point of 32 degrees Fahrenheit or 0 degrees Celsius, (i) sending a freeze warning message to a one or more remote computers or a one or more electronic communication devices,(ii) communicating with an intelligent thermostat with wireless technology to turn on a heating system for the one or more buildings or structures, or (iii) initiate a water freeze protection procedure that includes draining the main water supply line, or replacing the water in the main water line with an air, a nitrogen, or another gas or liquid having a low freezing point, or any combination thereof.~~ The water meter ~~and leak detection system~~ as recited in Claim 10, wherein the application programming interface (API)

comprises at least one of (i) a direct internet message encapsulation (ii) a simple object ~~assess~~ access protocol, (iii) a representational state transfer and an architectural style for distributed hypermedia systems, ~~(iv) a HTTP data message to an unsolicited HTTP request,~~ [[(v)]] (iv) a platform that uses a Java development kit to facilitate communication between APPs and external services over HTTP, [[(vi)]] (v) a document object module that is written in JavaScript that uses Java to handle operations of a web document, [[(vii)]] (vi) a simple event-driven algorithm for ~~lexing or~~ parsing XML documents [[(viii)]] (vii) a bidirectional read/write event-based method for ~~lexing or~~ parsing XML documents, [[(ix)]] (viii) an extensible markup language application programming interface and other application programming interface protocols that provides at least one of a control system architecture, or any combination thereof.

13. (currently amended) ~~The water meter and leak detection system as recited in Claim 10,~~ The water meter as recited in Claim 1, ~~wherein~~ further comprising [[the]] one or more electronic communication devices ~~comprises using~~ that include at least one of a smart cell phone, a mobile phone, a PDA, a tablet, a remote computer or server, a web portal, a smart or internet capable television, a wireless smartwatch, an remote computer operation center, or an another electronic communication apparatus or any combination thereof, wherein the electronic communication devices are configured to communicate with a one or more remote computers or a cloud service company, or any combination thereof.

14. (currently amended) ~~The water meter and leak detection system as recited in Claim 10, further including at least one of a mesh and a peer-to-peer technology circuitry wher the mesh and~~

~~the peer-to-peer technology enables on or more repeater apparatuses to communicate with a one or more water meter collection nodes;~~ The water meter as recited in Claim 10, further comprising an acoustic sensor, the memory further including instruction that, when executed by at least one of the CPU, the microprocessor, or the microcontroller, or any combination thereof, perform, based on one or more signals from the acoustic sensor, ~~identifying~~ identifies one of more water control valves or a leak condition.

15. (currently amended) ~~The water meter and leak detection system as recited in Claim 1, wherein at least one of the CPU, the microprocessor, or the microcontroller and any combination thereof, enters into a sleep mode between at least one of a water flow event, a leak test, transmitting or receiving the signal or command, and any combination thereof. The water meter and leak detection system as recited in Claim 10, including at least one of a mesh or a peer-to-peer technology circuitry, or any combination thereof, where the mesh or the peer-to-peer technology enables the one or more communication hubs or the one or more repeater apparatuses to communicate with a one or more water meter collection nodes.~~ The water meter as recited in Claim 10, further comprising one or more electronic communication devices that include at least one of a smart cell phone, a mobile phone, a PDA, a tablet, a remote computer or server, a web portal, a smart or internet capable television, a wireless smartwatch, an remote computer operation center, or an another electronic communication apparatus or any combination thereof, wherein the electronic communication devices are configured to communicate with a one or more remote computers or a cloud service company, or any combination thereof.

16. (currently amended) The water meter ~~and leak detection system~~ as recited in Claim 10, further comprising one or more water quality sensors configured to periodically monitor at least one of a pH, halogen, total dissolved solids, biological or fecal contamination, water hardness, metallic ion or any combination thereof.

17. (currently amended) The water meter ~~and leak detection system~~ as recited in Claim 10, wherein ~~the one or more wireless transceiver of collection node and the second wireless transceiver communication hub is configured to transmit a water data using blockchain technology.~~ the one or more wireless transceivers and the second wireless transceiver are configured to transmit water data, or receive the information, the signal or command, or any combination thereof, utilize blockchain technology.

18. (currently amended) The water meter as recited in claim 10, further comprising ~~a communication hub~~ that one or more collection nodes and a one or more communication hubs form or configure a private network or a corporate network that utilizes an application programming interface (API) when communicating with the remote computer system, a cloud service company, or the electronic communication device, or any combination thereof.

19. (currently amended) The water meter ~~and leak detection system~~ as recited in Claim 10, ~~wherein~~ further comprising that at least one of the CPU, the microprocessor, or the microcontroller, or any combination thereof, includes a software program that ~~monitors one or more flow events and~~ performs a water use device calibration mode, wherein the water use device calibration mode ~~commands~~ informs a user to

activate a water use device, fixture, or appliance ~~to be activated~~, [[and]] monitors and records one or more water flow events, ~~a water signature or a water pattern~~ and utilizes at least one of a software calculation, an algorithm, or an artificial intelligence to established water signatures or water patterns in identifying specific water use ~~devices, fixtures, or appliances~~ a water use device, fixture, or appliance.

20. (currently amended) The water meter ~~and leak detection system~~ as recited in Claim 10, ~~wherein~~ further comprising that at least one of the CPU, the microprocessor, or the microcontroller, or any combination thereof, ~~include~~ includes a software program that ~~monitors and records one or more water flow event to~~ performs an automatic learning mode, wherein the automatic learning mode ~~performs~~ executes a period of self-learning, monitors and records one or more flow events, and utilizes at least one of a software calculation, an algorithm or an artificial intelligence to established water signatures or water patterns in identifying specific water use devices, a fixtures, or an appliances.

21. (currently amended) A water meter comprising:

a base station interposed between a main water supply line for a ~~building or structure~~ one or more buildings or structures and a water supply from a water source provider;

the base station further comprising:

a) an electrical circuitry including at least one of a CPU, a microprocessor, or a microcontroller, or any combination thereof;

b) a power source electrically connected to the electrical circuitry, the power source obtained from an electrical supply ~~from~~ over a Power over Ethernet (PoE);

c) a one or more water flow rate sensors configured to sense and monitor ~~the flow of water~~ water flow through the main water supply line;

e) a memory including software instructions that, when executed by [[the]] at least one of the CPU, the microprocessor, or the microcontroller, or any combination thereof, perform monitoring or ~~calculations~~ calculating ~~of~~ a water data for the one or more buildings or structures, the water data comprising at least one of more water flow rate use, water use durations, total water volumes, or water energy use, or any combination thereof; and

wherein the water data is transferred to an internet connection via a Power over the Ethernet (PoE).

~~wherein the Power over Ethernet (PoE) is configures to via an application programming interface (API), (i) upload from the base stations to one or more remoter computers systems or to one or more electronic communication devices, the water data and (i) receive a signal or command from the one or more remoter computers systems or to one or more electronic communication devices~~

22. (currently amended) The water meter as recited in claim 21, further comprising a water control valve mechanism ~~comprising~~ including at least one of a ball valve, solenoid valve, piston valve, a variable open design valve, a three-way valve, or gate valve, or any combination thereof.

23. (withdrawn) The water meter as recited in Claim 21, the Power over Ethernet (PoE) allow a signal cable to upload the water data and simultaneously provide electric power to the base station.

24. (currently amended) The water meter as recited in Claim 21, further including one or more rechargeable batteries that are supplemented with electrical energy by a hardwired IEEE PoE 802.3af, IEEE 802.3at, or IEEE 803.2bt source, or any combination thereof.

25. (currently amended) The water meter as recited in Claim 21, wherein the Power over Ethernet (PoE) [cable] provides a direct connection to an internet connection through a residential or corporate router, or to a corporate or public network, or any combination thereof, and is configured to utilize an application programming interface (API) ~~(i) upload from the base station to a remote computer system the water data and (ii)) receive the signal or command from the one r more of the remote computer systems or the one or more electronic communication devices~~.

26. (currently amended) The water meter as recited in Claim 21, further comprising ~~the collection node communicates with a communication hub, wherein the~~ a communication hub that is connected by hard-wire to [[a]] the Power over Ethernet (PoE)

~~technology or~~ wherein the communication hub utilizes a one or more wireless transceivers to communicate with (i) a residential or corporate router for access to the internet, or (ii) to a corporation or a public network, or any combination thereof, [[,]] ~~is configured to upload from the base station to the one or more remote computers or one or more electronic communication devices the water data or receive the command or signal from one or more of the remote computers or the one or more electrionic communication devices.~~

27. (currently amended) The water meter [[are]] as recited in Claim 26, wherein the communication hub ~~utilizes the~~ includes one or more wireless communication transceivers, wherein at least one of the one or more wireless communication transceivers are configured to communicate via:

a wireless network protocol based on an IEEE 802.11 standard;

an infrared light transmission scheme;

a low power and long-range chirp spread modulation technology;

a network using the low power and long-range chirp spread modulation technology;

a wireless technology that transmits over a very narrow spectrum;

an Internet Protocol (IPv6) with a sub-1 GHz frequency;

a network is based on a star topology network with master and slave devices described in the EH 13757 standard which comprises operating modes S, T, R and C (868 MHz), F (433 MHz), and W (169 MHz);

an interoperable implementation of an IEEE 802.16 family of wireless-networks standards;

a network that uses a compatible smart speaker technology that provides cloud connectivity for [the] an internet of things (IoT) and utilizes low-bandwidth and long-range connectivity;

a third-generation wireless mobile telecommunications technology;

a fourth-generation wireless mobile telecommunications technology;

a fifth-generation wireless mobile ~~telecommunication~~ telecommunications technology;

or any combination thereof[[;]].

28. (currently amended) The water meter as recited in Claim 21, wherein when ~~at least one of the CPU, the microprocessor, or the microcontroller with~~ the one or more flow rate sensors detects the initiation of a water flow, the at least one of the CPU, the microprocessor, [[and]] or the microcontroller, or any combination thereof, instructs the water flow rate sensor to initiate monitoring or increase the sampling rate ~~at a~~

~~sufficient frequency capable to monitor at least one or more of a water flow rates, or more water use durations, or one or more total volumes or any combination thereof, until water flow stops defining~~ to define [[a]] the one or more water flow ~~event~~ events [[;]].

29. (currently amended) The water meter as recited in Claim 25, wherein the application programming interface (API) comprises at least one of i) a direct internet message encapsulation (ii) a simple object ~~assess~~ access protocol, (iii) a representational state transfer and an architectural style for distributed hypermedia systems, (iv) a platform that uses a Java development kit to facilitate communication between APPs and external services over HTTP, (v) a document object module that is written in JavaScript that uses Java to handle operations of a web document, (vi) a simple event-driven algorithm for ~~lexing and~~ parsing XML documents (vii) a bidirectional read/write event-based method for ~~lexing and~~ parsing XML documents, (viii) an extensible markup language application programming interface and other application programming interface protocols that provides at least one of a control system architecture, or any combination thereof.

30. (currently amended) The water meter as recited in Claim 22, further comprising a pressure sensor, the memory further including ~~instruction~~ instructions that, when executed by the at least one of the CPU, the microprocessor or the microcontroller, or any combination thereof, perform, based on pressure data obtained from the pressure sensor, (i) detecting one or more water patterns, water signatures, or leak conditions, or (ii) monitoring pressure changes when the base station closes the water control valve mechanism, or any combinations thereof.

31. (currently amended) The water meter as recited in Claim [[21]] 22, wherein the base station is configured to receive [the] a signal or command from one or more remote computers or one or more electronic ~~device~~ communication devices to transmit the water data, close the water control valve mechanism, to perform a leak detection analysis, or any combination thereof.

32. (previously presented) The water meter as recited in Claim 21, wherein the base station is configured to provide a registered user, owner or a monitoring facility, or any combination thereof, a warning or signal to one or more remote computer systems or to one or more electronic communication devices, in response to detecting a leak condition.

33. (currently amended) The water meter as recited in Claim 21, further comprising a temperature sensor ~~in close proximity to the main water supply~~.

34. (previously presented) The water meter as recited in Claim 33, wherein the memory further including instructions that, when executed by at least one of the CPU, the microprocessor or the microcontroller, or any combination thereof, perform, based on the temperature data from the temperature sensor that the temperature is approaching a freezing point of 32 degrees Fahrenheit or 0 degrees Celsius, (i) sending a freeze warning message to a one or more remote computers or a one or more electronic communication devices, (ii) communicating with an intelligent thermostat with wireless technology to turn on a heating system for the one or more buildings or structures, or (iii) initiate a water freeze protection procedure that includes draining the main water supply line, or replacing the

water in the main water line with an air, a nitrogen, or another gas or liquid having a low freezing point, or any combination thereof.

35. (currently amended) The water meter as recited in Claim 21, ~~wherein~~ further comprising one or more electronic communication devices that are configured to communicate with a one or more remote computers or a cloud service company, the one or more electronic communication devices includes ~~comprise using~~ at least one of a smart cell phone, a mobile phone, a PDA, a tablet, a remote computer or server, a web portal, a smart or internet capable television, a wireless smartwatch, an remote computer operation center, or an another electronic communication apparatus or any combination thereof.

36. (previously presented) The water meter as recited in Claim 21, further comprising an acoustic sensor, the memory further including instructions that, when executed by at least one of the CPU, the microprocessor, or the microcontroller, or any combination thereof, perform, based on acoustic data obtained from the acoustic sensor, identifying one of more water appliances or faucets water control valves or the leak condition.

37. (previously presented) The water meter as recited in Claim 21, wherein at least one of the CPU, the microprocessor, or the microcontroller or any combination thereof, enters into a sleep mode between at least one of a water flow event, a leak detecting test, or receiving the signal or command, or any combination thereof.

38. (previously presented) The water meter as recited in Claim 21, further comprising one or more water quality sensors

configured to periodically monitor at least one of a pH, halogen, total dissolved solids, biological or fecal contamination, water hardness, metallic ion or any combination thereof.

39. (currently amended) The water meter as recited in Claim [[21]] 27, ~~is configured to transmit a water data using blockchain technology~~ wherein the one or more wireless transceivers are configured to transmit water data, or receive the information, the signal or command, or any combination thereof, utilize blockchain technology.

40. (currently amended) ~~the water meter as recited in claim 26. Wherein the communication hub with wireless transceiver to configure a private network or a corporate network that utilizes an application programming interface (API) when communicating with the one or more remote computer systems or the one or more electronic communication devices.~~ The water meter as recited in Claim 21, further comprising at least one of the CPU, the microprocessor, or the microcontroller, or any combination thereof, that includes a software program that performs a water use device calibration mode, wherein the water use device calibration mode informs a user to activate a water use device, fixture, or appliance, monitors and records one or more water flow events, and utilizes at least one of a software calculation, an algorithm, or an artificial intelligence to establish a water signature or a water pattern in identifying the water use device, fixture, or appliance.

41. (currently amended) The water meter ~~and leak detection system~~ as recited in Claim 21, further comprising at least one of the CPU, the microprocessor, or the microcontroller, or

any combination thereof, that includes a software program that performs an automatic learning mode, wherein the automatic learning mode implements a period of self-learning, monitors and records one or more water flow events, and utilizes at least one of a software calculation, an algorithm or an artificial intelligence to establish a water signature or a water pattern in identifying ~~specific~~ water use devices, [[a]] fixtures, or [[an]] appliances.

42. (currently amended) ~~The water meter and leak detection system as recited in Claim 21, further comprising at least one of the CPU, the microprocessor, or the microcontroller, or any combination thereof, includes a software program that performs an automatic learning mode, wherein the automatic learning mode implements a period of self-learning, monitors and records one or more water flow events, and utilizes at least one of a software calculation, an algorithm or an artificial intelligence to establish a water signature or a water pattern in identifying specific water use devices, a fixtures, or an appliances.~~ The water meter as recited in Claim 5, wherein the memory further includes instructions that, when executed by at least one of the CPU, the microprocessor or the microcontroller, or any combination thereof, performs, based on temperature data from the temperature sensor, that the temperature is approaching a freezing point of 32 degrees Fahrenheit or 0 degrees Celsius, (i) sending a freeze warning message to the one or more remote computer systems or the one or more electronic communication devices, or (ii) initiate a water freeze protection procedure that includes draining the main water supply line, or replacing the water in the water line with an air, a nitrogen, or another gas or liquid having a low freezing point, or any combination thereof.

43. (new) The water meter as recited in Claim 10, further comprising a temperature sensor.

44. (new) The water meter as recited in Claim 43, wherein the memory further includes instructions that, when executed by at least one of the CPU, the microprocessor or the microcontroller, or any combination thereof, performs, based on temperature data from the temperature sensor, that the temperature is approaching a freezing point of 32 degrees Fahrenheit or 0 degrees Celsius, (i) sending a freeze warning message to the one or more remote computer systems or the one or more electronic communication devices, or (ii) initiate a water freeze protection procedure that includes draining the main water supply line, or replacing the water in the water line with an air, a nitrogen, or another gas or liquid having a low freezing point, or any combination thereof.

45. (new) The water meter as recited in Claim 1, wherein the base station is configured to provide a registered user, owner or monitoring facility, or any combination thereof, a warning or signal to a one or more remote computer systems or to a one or more electronic communication devices, in response to detecting a leak condition.

46. (new) The water meter as recited in Claim 10, wherein the base station is configured to provide a registered user, owner or monitoring facility, or any combination thereof, a warning or signal to a one or more remote computer systems or to a one or more electronic communication devices, in response to detecting a leak condition.

47. (new) The water meter as recited in claim 21, wherein the Power over Ethernet (PoE) is configured to (i) transfer from the base station to one or more remote computer systems, a cloud service company, or to a one or more electronic communication devices, a water data and (ii) receive a signal or command from one or more of the remote computer systems, a cloud service company or one or more electronic communication devices.

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Response to Non-compliant Claims

The Applicant has withdrawn 1 claim and added three (3) new claims and marked accordantly. The Applicant will pay for the additional 2 claims with the filing of this Response.

The Examiner stated that Claim 1 reincorporates the limitations of bullet point "f' of "the one or more wireless communication transceivers comprising" without underlining the limitation. Claim 1 also failed to cancel the last "wherein" clause of previously filed Claim 1 in the amended Claim 1.

Response:

The Applicant has underlined "the one or more wireless communication transceivers wherein" and included the cancelled ast "wherein" clause and therefore, addressed the objections that the Examiner had defined and believes the issue is now resolved. The Applicant also noticed that he failed to cancel previous August 8, 2023 clause in section G and has correct this as well.

The Examiner stated that Claim 5 recites all new claim limitations without cancelling any of the previously amended limitations.

Response:

The Applicant has addressed the objection by including the cancelled amended limitations from the August 8, 2024 submission

and then the cancelled amended limitations from the November 17, 2024 submission, and therefore, addressed the objections the Examiner had defined and the Applicant believes the issue is now resolved.

The Examiner stated that Claim 7 cancels all of the limitations of the originally examined claim set, but fails to cancel any and all of the amended claim set as presented previously, while also presenting new limitations.

Response:

The Applicant has addressed the objection by including the correct cancelled amended limitation from the August 8, 2024 submission that the Examiner had defined and believes the issue is now resolved.

The Examiner stated that Claim 9 fails to cancel any and all of the claim limitations as provided in the previous response and has instead provided the originally examined limitations without showing anything canceled.

Response:

The Applicant has addressed the objection by including the cancelled amended limitations from the August 8, 2024 submission and then the cancelled amended limitations from the November 17, 2024 submission that the Examiner had defined and the Applicant believes the issue is now resolved.

The Examiner stated that Claim 10 fails to cancel any and all limitations from the previously amended response and has instead included new limitations.

Response:

The Applicant has addressed the objection by including the cancelled amended limitation from the August 8, 2024 submission that the Examiner had defined and believes the issue is now resolved.

The Examiner stated that Claim 11 has been amended without canceling the previously disclosed limitations presented in the previous response.

Response:

The Applicant has addressed the objections by cancelling the correct previously disclose limitations from the August 8, 2024 submission that the Examiner had defined and the Applicant believes the issue is now resolved.

The Examiner stated that Claim 12 had re-cancelled the same amendments that were already cancelled from the originally examined claims. The Examiner also stated that Claim 12 is also defective in further failing to cancel the newly added limitations from claim 12 presented in the previous response.

Response:

The Applicant has addressed the objections by cancelling the previously added limitations from the August 8, 2024 submission and make corrections to the limitations from the November 17, 2024 submission that the Examiner has defined and the Applicant believes the issue is now resolved.

The Examiner stated that Claim 13 claims correspondence back to both claims 10 and 1. Further, claim 13 is amended to include the exact same subject matter as the previous response, but also fails to cancel the amended limitations of the previous response.

Response:

The Applicant has addressed the objection by deleted the correspondence to claim 10 that the Examiner had defined and believes the issue is now resolved.

Response:

The Applicant has addressed the objection that the Examiner has defined and the Applicant believes the issue is now resolved.

The Examiner stated that Claim 14 is amended to include limitations to include depending from claim 10 twice in the same sentence.

Response:

The Applicant has addressed the objection by deleting limitations to depend from only claim 10 once (deleted the

superfluous correspondence to claim 10) that the Examiner had defined and the Applicant believes the issue is now resolved.

The Examiner stated that Claim 15 has been amended without cancelling the previously disclosed limitations from the previous response.

Response:

The Applicant has addressed the objection by cancelling the previously disclose limitations from August 8, 2024 and cancelling the limitations from November 17, 2024 that the Examiner had defined and believes the issue is now resolved.

The Examiner stated that Claim 16 has includes the same limitations which were included in the previous response, but are included as amendments again.

Response:

The Applicant has addressed the objection by removing the underlined limitation and made a correction that the Examiner had defined and the Applicant believes the issue is now resolved.

The Examiner stated that Claim 18 purports to originally depend from claim 1. That's incorrect. The previous response disclosed claim 18 as depending from claim 5.

Response:

The Applicant has addressed the objection by purporting to depend on claim 10 that the Examiner had defined and believes the issue is now resolved.

The Examiner stated that Claim 10 incorrectly cancelled the wrong limitations from a previously filing while also incorporating previously amended language as underline/newly disclosed limitations especially see step f) and further).

Response:

The Applicant has addressed the objection by purporting to depend on claim 10 that the Examiner had defined and the Applicant believes the issue is now resolved.

The Examiner stated that Claim 27 is a new claim, yet includes amended language (crossed out), underlined and bracketed, in a new claim.

Response:

The Applicant has addressed the objection by removing all crossed out, underline and bracketed ([the] in paragraph f) in the new claim that the Examiner had defined and the Applicant believes the issue is now resolved.

The Examiner stated that Claim 29 is a new claim, yet includes removed limitations in the same underlined portion.

Response:

The Applicant has addressed the objection by removing the crossed out ~~(vii)~~ that the Examiner has defined and the Applicant believes the issue is now resolved.

The Examiner state the Claims 42-44 are newly added limitations which are disclosed as "previously presented" which in not a correct designator.

Response:

The Applicant has addressed the objection that the Examiner has defined and the Applicant believes the issue is now resolved.

Other non-compliant issues were in Claims 27 and 28 where the claim ended with a ";" instead of a period which is now corrected.

28th day of February 2025.

Respectfully submitted,

/Michael E. Klicpera/

Attorney for Applicant
Registration No. 38,044

PTO/SB/06 (09-11)
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| PATENT APPLICATION FEE DETERMINATION RECORD<br>Substitute for Form PTO-875 | Application or Docket Number<br>17/981,454 | Filing Date<br>11/06/2022 | ☐ To be Mailed |
|---|---|---|---|

ENTITY: ☐ LARGE ☑ SMALL ☐ MICRO

## APPLICATION AS FILED - PART I

| FOR | (Column 1)<br>NUMBER FILED | (Column 2)<br>NUMBER EXTRA | | RATE ($) | FEE ($) |
|---|---|---|---|---|---|
| ☐ BASIC FEE<br>(37 CFR 1.16(a), (b), or (c)) | N/A | N/A | | N/A | |
| ☐ SEARCH FEE<br>(37 CFR 1.16(k), (i), or (m)) | N/A | N/A | | N/A | |
| ☐ EXAMINATION FEE<br>(37 CFR 1.16(o), (p), or (q)) | N/A | N/A | | N/A | |
| TOTAL CLAIMS<br>(37 CFR 1.16(i)) | minus 20 = | * | | x $50 = | |
| INDEPENDENT CLAIMS<br>(37 CFR 1.16(h)) | minus 3 = | * | | x $240 = | |
| ☐ APPLICATION SIZE FEE (37 CFR 1.16(s)) | If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s). | | | | |
| ☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j)) | | | | | |
| * If the difference in column 1 is less than zero, enter "0" in column 2. | | | | TOTAL | |

## APPLICATION AS AMENDED - PART II

| | | (Column 1) | | (Column 2) | (Column 3) | | | |
|---|---|---|---|---|---|---|---|---|
| AMENDMENT | 02/28/2025 | CLAIMS REMAINING AFTER AMENDMENT | | HIGHEST NUMBER PREVIOUSLY PAID FOR | PRESENT EXTRA | | RATE ($) | ADDITIONAL FEE ($) |
| | Total<br>(37 CFR 1.16(i)) | * 47 | Minus | ** 43 | = 4 | | x $80 = | 320 |
| | Independent<br>(37 CFR 1.16(h)) | * 3 | Minus | *** 3 | = 0 | | x $240 = | 0 |
| | ☐ Application Size Fee (37 CFR 1.16(s)) | | | | | | | |
| | ☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j)) | | | | | | | |
| | | | | | | | TOTAL ADD'L FEE | 320 |

| | | (Column 1) | | (Column 2) | (Column 3) | | | |
|---|---|---|---|---|---|---|---|---|
| AMENDMENT | | CLAIMS REMAINING AFTER AMENDMENT | | HIGHEST NUMBER PREVIOUSLY PAID FOR | PRESENT EXTRA | | RATE ($) | ADDITIONAL FEE ($) |
| | Total<br>(37 CFR 1.16(i)) | * | Minus | ** | = | | x $0 = | |
| | Independent<br>(37 CFR 1.16(h)) | * | Minus | *** | = | | x $0 = | |
| | ☐ Application Size Fee (37 CFR 1.16(s)) | | | | | | | |
| | ☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j)) | | | | | | | |
| | | | | | | | TOTAL ADD'L FEE | |

| | |
|---|---|
| * If the entry in column 1 is less than the entry in column 2, write "0" in column 3. | LIE |
| ** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20". | /VINCENT S BUTLER/ |
| *** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3". | |
| The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1. | |

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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